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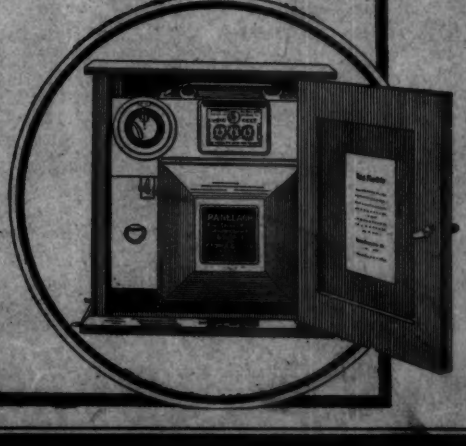

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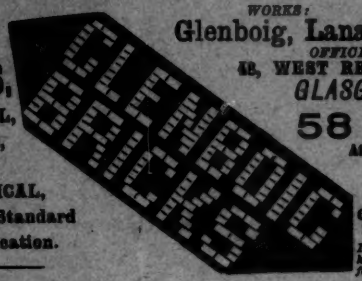

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VOL. CLXIII., No. 3142.] WEDNESDAY, AUGUST 1, 1923. [75TH YEAR.

EDITORIAL NOTES.

Gaseous Combustion at High Pressures—The Disclosures of Research.

WE are publishing *in extenso* the Friday Evening Discourse which Prof. W. A. Bone, D.Sc., Ph.D., F.R.S., recently delivered before the Royal Institution. There has previously been very little research into the subject of gaseous combustion at high pressures; and in carrying out, at the Imperial College of Science, the work upon which he has been engaged for some years past, Prof. Bone is doing something that is altogether original, and undoubtedly will be practically valuable as the new knowledge that is being gained develops. Higher flame temperatures and pressures are in use to-day than was hitherto the case; and therefore Prof. Bone has here taken up a line of investigation which should be of considerable utility in connection with the high-flame temperature applications of gas, internal combustion engines, and (as will be seen from the discourse itself) in respect of the problem of nitrogen fixation. It cannot be gainsaid that we are far from understanding completely even the simplest of known cases of gaseous combustion; and it is upon these that the high-pressure researches are throwing new light. But in carrying them out, explorations as they are into regions beyond those previously investigated, and at high pressures, it was necessary to design new apparatus and to formulate new methods of procedure.

The present discourse treats of the work done especially with the view of elucidating the problem of the apparent slowness of the combustion of carbon monoxide as compared with that of hydrogen in air at high pressures. Little has hitherto been known of this subject. As Prof. Bone pointed out, the supposed suppression of heat in explosions is a matter upon which light is being sought by engineers who in their own way are studying internal combustion problems, without troubling themselves much with the mechanism of the chemical changes involved. We remember that Sir Dugald Clerk on one occasion referred to the fact that a proportion of inerts in gas used for gas-engine purposes was regarded as an advantage by gas-engine makers in these days of higher compressions. He then spoke of the difficulty they had when, with straight coal gas, they exceeded a compression ratio of 5 to 5½. In fact, he said they had actually, with higher compressions, "to add to coke-oven gas a certain proportion of cold ex-"haust gases, for the sake of the carbonic acid, so as to lower "the flame temperature in the cylinder, and so reduce the "liability to pre-ignition." At the same time, he pointed out that the users of engines did not want to pay for inerts which they could get from the atmosphere. Prof. Bone particularly deals with his recent discovery that nitrogen has the remarkable power of absorbing the particular radiation emitted by carbon monoxide when burning at high pressures. The knowledge conveyed by this exploration into the problems of gaseous combustion, only shows how remote we still are from any real understanding of its very elements, and how much scope there is in this field for further fundamental research. Even in regard to the two simplest gases upon which the research has been made —hydrogen and carbon monoxide—there has been, from the chemical point of view, as Prof. Bone remarks, something enigmatical about their apparently different behaviour. Notwithstanding that their volumetric heats of combustion and the proportion by volume in which each of them combines with oxygen are the same, yet in many respects their modes of combustion in air present a striking contrast. What is the reason of this? This is one of the important facts that Prof. Bone has set out to elucidate in this investigation. This elucidation is facilitated by working at high pressures, which, as he explains, tend to show-up and accentuate the operation of factors whose influence is either masked or overlooked at ordinary pressures. In his recent Royal Society memoir on the subject, Prof. Bone indicated that in all probability the peculiar rôle which nitrogen plays in the combustion of carbon-monoxide-air mixtures will be "materially influenced by the initial pressures at which the explosive mixtures are fired;" and as since then he has been studying this aspect of the problem, the results of his further experiments will be awaited with interest.

We cannot pass in review here all that is to be gleaned from the account of the work and its results; but only as to the principal findings. In the first place, nitrogen is always spoken of and regarded as inert in combustion; but in future such view must be qualified. In the combustion of carbon monoxide at high pressure, for example, it certainly cannot be regarded as inert, because of the peculiar energy-absorbing influence it exerts far beyond that of other diatomic diluents, or even of argon. The result of the influence so exerted is to retard considerably the attainmen tof maximum pressure, and to diminish somewhat the maximum temperature. Secondly, it is shown that the peculiar power which nitrogen possesses of absorbing the radiant energy emitted during the combustion of carbon monoxide at high pressures is not manifested at all when it is present in hydrogen-oxygen mixtures similarly undergoing combustion. In other words, there would appear to be some constitutional correspondence between carbon monoxide and nitrogen molecules whereby the radiation emitted when the one burns is of such a quality as can be readily absorbed by the other—the two thus acting in resonance. Thirdly, we learn that the presence of hydrogen in a carbon-monoxide-air mixture undergoing combustion strongly counteracts the peculiar energy-absorbing influence referred to. And, finally, it is shown that carbon monoxide will burn in oxygen at high pressures almost as, but not quite so, rapidly as does hydrogen—provided that no nitrogen is present. To put the matter in another way, the "slow-burning" character which is commonly attributed to carbon monoxide is probably not so much inherent to the gas itself, as it is conditional upon the presence of nitrogen in the burning mixture.

There we have from this investigation results of fundamental importance to further research, and probably to significant development in respect of the problem of the fixation of nitrogen. In the early part of the discourse, Prof. Bone spoke of the peculiar influence of a small addition of hydrogen to a carbon-monoxide-air mixture undergoing combustion—whether at atmospheric pressure or exploded at high pressure. But towards the end he states that a similar small addition of hydrogen to a normal carbon-monoxide-air moisture undergoing combustion at high pressure is prejudicial to the "activation" of nitrogen. Having proved that nitrogen can be activated by the combustion of carbon monoxide at high pressures, especially when hydrogen is as far as possible excluded, attention is directed to the fact that in blast-furnace gas there is an almost unlimited supply of just the kind of raw material from which undoubtedly nitric acid could be easily produced under the conditions

indicated by the experiments. Prof. Bone gives expression to the hope that these possibilities will be thoroughly explored at home, and not be left to foreign organizations, who will probably not be slow to seize upon them. We trust that these aspirations will be fulfilled. All too often our men of science have commenced work, and carried it to a point where unaided they could not well go farther; and then the potentialities of their achievements have been realized in other lands, with the inevitable result. There is no intention on the part of Prof. Bone to relinquish the work; but unassisted it has limits. Let us give an example in his own words: "We are approaching the safety "limits of the bomb [used in these high-pressure experi- "ments]. If funds were forthcoming for the construction "of a new bomb, with the necessary accessories, to enable "us to work at still higher initial pressures than we have "hitherto employed, we should be able to study the effects "of subjecting small quantities of diluent gases to the com- "bined influence of exceedingly high temperatures and in- "tensive research." In the interests of science, we add our hope to that of Prof. Bone that it may be possible for him and his devoted assistants to pursue this aspect of his important research. Want of funds should not be permitted to close the door upon research which has reached the stage disclosed in the discourse, when the men are still available who have done so much, and are the only ones who have complete and intimate knowledge of the details of the work which has resulted in present achievement.

Gas Manufacture and Sales in 1922.

The returns relating to statutory gas undertakings are increasing in value year by year. This time we can congratulate the responsible department at the Board of Trade in issuing Part I.—that dealing with the manufacturing and sales operations of all statutory gas concerns—so near to the period to which the statistics refer. It applies to the year 1922. This is a distinct improvement. There is substantial evidence, too, that progressively the returns will have more and more interest, in view of the fact that, though figures cannot yet be given as to the total sale of therms, we shall, as the years pass, get closer and closer to the time when aggregate data can be supplied. The total figures as to gas make and consumption can for the present only be returned in cubic feet; and those cubic feet may vary in potential thermal value by any percentage up to (say) 40, for certain undertakings may supply gas of 560 B.Th.U., and others fall as low as 400 B.Th.U. This condition of things the Board of Trade cannot possibly rectify until the change to the scientifically correct basis has been completely made, and all statutory undertakings have a year's working data to present with the therm system in operation. Of course, therm statistics are in the returns for individual gas undertakings; but the period of transition —owing to the fundamental character of the elements constituting the change—must necessarily be a long one. Part II. of the returns, relating to financial matters, will probably be published soon.

Turning to the total statistics as presented in Part I., progress in manufacturing efficiency and commercial expansion is divulged which—having in view the industrial and trade depression last year, and the consequent unemployment—is satisfactory; and the additional new consumers, with the gradual improvement in trade, supply good promise for the future. As to the materials used in the manufacture of gas, it is observed that the quantity of coal carbonized by the statutory undertakings in 1922 was 15,907,095 tons, or an increase of 131,399 tons compared with 1921. But there was a decrease in the use of coke and oil for water-gas making. The amount of coke gasified for this purpose was 1,057,909 tons, or a decrease of 196,213 tons; and the oil used amounted to 46,145,160 gallons, or a quantity smaller by 5,586,332 gallons. There is no discrimination between blue and carburetted water gas; but, calculating over the whole quantity of water gas produced, the average consumption of oil is 1·05 gallons per 1000 c.ft. The coal gas made amounted to 201,963,546,000 c.ft., or an increase of 7,445,399,000 c.ft. The water gas manufactured totalled to 43,946,129,000, or a reduction of 5,948,587,000 c.ft. The two figures—coal gas and water gas—make 245,909,675,000 c.ft.; the water gas representing rather less than 18 p.ct. of the aggregate make of the two gases. However, the 245,909,675,000 c.ft. do not represent the total of the gas produced for town supply. There is the "other gas." But we suggest to the Board of Trade that they should relinquish their efforts to discriminate between coal and water gas and "other gas," because the "other gas" only leads to confusion and inaccuracy. All that it is necessary to do is to make a separate entry of acetylene gas; put a footnote to the coal gas made stating the total quantity of coke-oven gas included in the figure; and then make a judicious allocation between coal and water gas for the remaining production. For example, we see under "other gas" that the estimated quantity of gas made by steaming in the Bradford vertical retorts is included. Why Bradford, when there are to-day numerous undertakings practising steaming in vertical retorts, and the extra gas so made is no doubt included under coal gas? Then "mixed coal and water gas" is mentioned. No doubt this is gas made by one of the combined systems —probably the Tully; and yet Tully gas is specifically referred to in other items. If all the gas so made were included, the figures would be of a totally different character. As presented, they are incomplete. In these cases we would suggest that the gas engineers should be asked to estimate the proportions of coal and water gas in the total; or where it is a matter of complete gasification of coal, we cannot see why the figures should not be added to the coal gas. Anyway, the figures for "other gas" are useless for the reasons indicated. The data show that 3,635,678,000 c.ft. of coke-oven gas were purchased by authorized gas undertakings. However, we finally come to the figure of 252,070,321,000 c.ft. as the quantity of gas produced for town supply during the year; and that is an increase on 1921 of 3,050,589,000 c.ft. Two other figures in this connection. We calculate that the average production of gas per ton of coal used in 1922 was 12,700 c.ft.; while in 1921, the production was 12,330 c.ft.—an average increase per ton of 370 c.ft. over the nearly 16 million tons used. There is no question that there is greater efficiency in our carbonizing practices to-day; and latterly, as they have become cheaper, higher grade coals have been purchased. On the other hand, if the comparison could be made in therms, we should know the definite value of the increased production.

Passing from manufacture to sales, the total quantity of gas sold by the statutory undertakings of Great Britain during the year was 232,602,789,000 c.ft.—an increase of 3,525,677,000 c.ft. There was a decrease in the consumption by prepayment consumers—a reflection of the considerable amount of unemployment that existed in 1922—but the increased consumption by the ordinary consumers and the public lamps wiped that out, and gave the extension of business of nearly 3526 million c.ft. The consumption by the prepayment consumers was 78,224,063,000 c.ft., or 2,061,595,000 c.ft. less than in 1921. The sales to ordinary consumers ascended to 146,174,788,000 c.ft.—an increase on 1921 of 4,406,756,000 c.ft.; and public lamps drew upon the mains to the extent of 8,203,938,000 c.ft.—an increase of 1,180,516,000 c.ft. These figures are illuminating; as are others when prospects are under examination. We observe that the number of ordinary consumers at the end of 1922 was 3,535,137—an increase of 47,047. The number of prepayment consumers was 4,137,009—an increase of 65,789. The two increases added together give the gas industry of Great Britain in the one year additional connections numbering 112,836—making the total 7,672,146. If it is assumed that each connection represents an average of five members of the population, we find that gas renders service to no less than 38,360,730 of the total population. This is a proportion of which we may be proud, and yet on practically every one of those connections there is room for the further use of gas. It is also observed that the length of mains is now 40,231½ miles—an increase in the year of 683¾. The average consumption in 1922 per ordinary consumer was 41,349 c.ft., and per prepayment consumer 18,908 c.ft.

As to secondary products, it has been seen that 131,399 tons more coal were carbonized in 1922 than in 1921. It is not astonishing, therefore, to find that the production of coke increased by 70,453 tons to 10,475,155 tons; but it is surprising to notice that the yield of tar increased by no less than 9,394,059 gallons to 169,770,531 gallons. Can anyone explain the reasons for this extra yield of close upon 9½ million gallons, using only an extra 131,399 tons of coal? But another surprise is that the production of sulphate of ammonia by the statutory undertakings fell by 2606 tons to 113,373 tons, despite the greater quantity of coal carbonized. There are things which statistics alone cannot explain; and elucidation has to be sought among such factors as conditions in the markets. This is probably one of them.

Equity of Meter and Stove Rents.

In discussing, in our issue of July 18, the Edinburgh case, in which the legality of the policy of the Gas Department respecting the lending-out of appliances free or at inadequate rents was the point at issue, it was distinctly mentioned that we did so upon its individual merits, without entering (as we have done on previous occasions) into the question of the general principles that should govern policy in dealing with gas-consuming appliances. But now, in view of an article on the subject that appears in other columns from Mr. George Evetts, M.Inst.C.E., we will say this: That inasmuch as, if the charges attaching to meters or gas-consuming appliances are not realized by direct rentals, they must be provided in the price of gas, the most equitable policy is to charge adequate rents for both meters and gas-consuming appliances, having regard to the large diversity there is in the consumptions of different consumers. In such cases, however, as Edinburgh, where a flourishing business has been built-up along a certain line of policy, it would be ridiculous to alter it, and so upset a system to which the consumers are accustomed, and which has worked well to the general advantage—just as it has, if not always equitably, in connection with the prepayment system of gas supply. One cannot uproot an established policy of the kind without inflicting damage. Of course, the object of the Edinburgh traders was to get the policy of the Gas Department abolished, and to transfer the business, if possible, to their own hands. But the realizing and maintenance of the best efficiency with gas appliances is a matter for the specialist; and this is being recognized more and more—not only by gas undertakings themselves, but by the central powers at Westminster. There is evidence of this in the Gas Regulation Act; there is recognition of it in the report of the Departmental Therm Charges Committee; and there was again evidence of it in the suggestions for consideration that emanated from the Board of Trade Conference on the question of safety in gas distribution and use. There is very good reason why those who really cultivate the gas business, and have an interest in the use of the appliances after installation, should be the ones to have a hand in their selection, and a voice in the correctness of their installation, and not tradesmen who, after the sale of an appliance and its fixing, have no more concern in it. The rectification of any deficiencies there are in it, more often than not falls upon the gas suppliers; otherwise, in the eyes of the consumer, it is not the appliance that is at fault, but either the quality or the pressure of the gas. The decision in the Edinburgh case has, Mr. Evetts says, given universal satisfaction; and we believe he is right. Nothing to the contrary has been heard; and we cannot see how any one in the industry could uphold the proposition that the administrators of a gas undertaking should be deprived of discretionary power in respect of the best policy to adopt and pursue in developing the gas business in any locality.

In his article, Mr. Evetts takes us beyond the question as to whether the Edinburgh Corporation Gas Department were acting *ultra vires* in what they were doing in respect of the supply of gas appliances and running their showrooms. He enters both argumentatively and from the points of view of practical finance and of equity into the question of charging rents; and in every respect we are with him. Very broad grounds offer sufficient justification without going into details. In the case of ordinary meters, now that the characteristics of gas supply have changed so considerably, meter-rents should be levied, and the charges should not be included in the price of gas per therm or per 1000 c.ft. To do this is totally unfair to the consumer with any diversity of demand, and a large total consumption, because the greater his consumption, the more he pays for the meter; whereas there are other people with meters fixed who are sparing in their use of gas, and whose consumption is altogether inadequate to supply compensation, at the average figure included in the simple price charged them for gas, for the various costs appertaining to the meter. It is inequitable that the good consumer should, through the averaging of meter charges in the price of gas, pay part of those incidental to the supply of the consumer of slender patronage. The point has become accentuated since some householders have "all-gas" kitchens, and perhaps several fires; while others may only use the gas for (say) lighting purposes. Some of the latter do not, through their meagre consumption in these days of incandescent burners, pay the whole of the charges involved in the provision of the supply to them. There are those people, too, who may use the service and the meter merely as a stand-by to some other method of lighting of a less reliable character. A meter-rent is some protection to the undertaking in such cases; but the operation of a stand-by clause (as has been generally adopted in modern legislation) is better still. Mr. Evetts points out that there is some palliation of inequity as between the good and the bad consumer where meter-rents are not charged, by the operation of a system of discounts. That is true, but only within limits, which limits are exceeded by the consumers who use gas (say) merely for lighting, or the meter and service solely for stand-by purposes. Without special powers of charge and a system of discounts, such extreme conditions as are met with in respect of gas consumption in these days cannot be negotiated with rigid equity to all concerned.

Rents for gas-consuming appliances raise very similar considerations. Where the charges pertaining to the appliances are included in the price of gas, it is found that some of the latter are used freely; others with a frugality that defies the appropriate charges being provided by the amount of gas consumed. The former will be productive; the latter will not be. The same inequality results from the supply of appliances rent free, as in the case of meters. There are large consumers of gas (Mr. Evetts instances factory owners) who may not require such appliances; and yet their consumption may greatly exceed that of a householder with certain gas-consuming appliances that have been supplied to him rent free. Unless the factory owner is allowed a discount, he will be providing, in the total sum that he pays, some of the cost incidental to the provision of rent-free cooking or heating appliances for householders. This would be inequitable. Then, again, rent-free gas appliances must have the effect of preventing people purchasing appliances outright, or acquiring them on the hire-purchase system. This is a distinct disadvantage to the gas undertaking for more reasons than one—and an important one is that such purchases save capital expenditure, and, unlike the appliances out on hire, the purchased ones cannot be returned. This is a benefit. We will not follow the details of Mr. Evetts' contribution. But this we will say, that no one who studies the article would change from the rental system for meters and gas appliances to their free supply, if equity as between consumer and consumer has any place among the considerations upon which decision is made. Those who have free meters in operation might be inclined to impose rents, and at the same time reduce the price of gas; but where appliances have been supplied free (though the charges are included in the price of gas), we should be loth, in view of the damage that might be occasioned, to advise a change to the policy of direct rents, notwithstanding it is the correct and the equitable one.

The Patched Smoke Abatement Bill.

The promise of the Government to introduce a "new" Smoke Abatement Bill has not been fulfilled. It is the measure of the late Government, with a few patches on it—particularly with a view to pleasing Sheffield. It is a curious thing that Government after Government appear to dread to deal with this matter in a statesmanlike and constructive manner. They probably fear that, if they do so, they will meet with some terrible calamity. They treat the domestic chimney as sacrosanct, despite the cumulative influence of those chimneys in polluting the atmosphere, and introducing conditions unhealthy for human and other life. What is wanted is more legislative enterprise in this matter, so as to empower local authorities to do something progressive (without at present aiming at finality) in limiting the burning of crude bituminous coal for household purposes. To our mind, there is not, for example, the slightest reason why section 4 of the new Bill should contain the words "other than private dwelling-houses," when conferring powers upon the appropriate local governing bodies to make bye-laws requiring the provision in new buildings of such arrangements for heating as are calculated to prevent or reduce the emission of smoke. The exclusion of new private dwellings is unnecessary. The Government in this Bill have, as did their predecessors, concentrated their attention upon industries. They have increased the penalties imposed by the Public Health Act of 1875 for the emission of smoke (notwithstanding that it is

not "black") from chimneys other than those of private dwelling-houses. Again, smoke is to include "soot, ash, grit, and gritty particles." There is no objection to the suppression of these public annoyances. In these times there is no occasion for even industrial chimneys being a nuisance to a neighbourhood, unless circumstances are very exceptional. Consideration has been given to the representations of the steel industry, with the result that it is proposed that section 334 of the Public Health Act is to have effect as if there were included among the processes specified in that section those of reheating and annealing, hardening, forging, converting, and carburizing iron and other metals. But present inclusion in the section named does not necessarily mean permanence; for there is a proviso that the Minister of Health may, by Provisional Order, at any time after the expiration of five years from the passing of the Act, exclude from the application of the section named any processes specified in that section as amended by this sub-section, so far as smoke nuisances are concerned.

The Bill supplies abundant scope for contention before penalties are imposed. It is provided that, in any proceedings for sending forth smoke from a chimney in such quantity as to be a nuisance, it shall be a defence for the person charged to show that he has used the best practicable means for preventing the nuisance, "having regard to the cost and to local conditions and circumstances." If the Bill passes, we shall expect to see a large number of occupants of this ground of defence. And again, in any case in which bye-laws for the purpose have been made by the local authority, the emission (during such period as may be prescribed by the bye-laws) of black smoke of such density and volume as may be prescribed, will allow the presumption, until the contrary is proved, that such emission is a nuisance. We foresee here a beautiful chaos as to the prescriptions regarding "black" smoke, in respect of the density and volume that constitute a nuisance. It appears that the Government do not consider the Ministry of Health are the proper authority to fix standards for the measurement of black smoke. Nevertheless, we imagine the Ministry of Health have resources that local authorities do not possess; and yet what the Ministry of Health cannot, or will not, do local authorities are expected to do—local authorities perhaps constituted of men personally interested. We can see a variety of prescriptions coming along from different districts, with considerably varying degrees of densities and volumes of black smoke considered to constitute a nuisance. Any local authority "may," and shall if so required by the Minister of Health, make bye-laws for the purpose of dealing with smoke. In connection with which, one of the duties—not obligatory, but permissive—of the Minister of Health is that he "may," after a public inquiry, and after consultation with any local authorities or interests concerned, make Orders extending the list of noxious or offensive gases mentioned in section 27 of the Alkali Works Regulation Act, and the list of works in the first schedule to that Act. Local authorities who neglect to carry-out their duties in respect of smoke nuisances, or who fail to make bye-laws when requested to do so by the Minister of Health, will find, if the Bill passes, that the latter may authorize the county council to perform the duties, and the expenses of them will have to be defrayed by the local authority.

We cannot see that the Bill does much more than the previous one towards producing any real solution of the great problem of smoke abatement, which problem has grown very much in magnitude since the passing of the Public Health Act of 1875. This fact appears to have been overlooked by the authors of the proposed legislation in designing the additional punitive measures against industry. These may be highly desirable; but they do not show originality, nor do they reveal new legislative enterprise, or genuine constructive desire, in respect of this important problem.

Well Done, Hornsey!

The Hornsey Gas Company, of which Mr. J. W. Buckley is the Engineer and General Manager, will again lead in the London area in the matter of price per therm, from the September meter readings. The Directors last Friday resolved to reduce the charge from 8¼d. to 8d. At 8¼d., they were in line with the South Metropolitan Company, and only 0·1d. in front of the Gas Light and Coke Company. Now they will be, unless further movement is made, 0·5d. lower than the South Metropolitan and 0·6d. below the Gas Light Company. And Hornsey has not the advantage of water carriage.

At the National Gas Exhibition.

The arrangements are gradually shaping themselves for the joint meeting of members of the Salesmen's Circles at the National Gas Exhibition in Birmingham; and in some quarters there is hope that the Junior Gas Associations may take part in the event. Anyway, that is a matter for discussion and decision. A provisional programme has been arranged. Saturday, Sept. 22, is the appointed day. The idea is to have lunch at 1 o'clock; and then at 2.15 to hold a business meeting. At this, Mr. F. W. Goodenough, the Executive Chairman of the "B.C.G.A.," has promised to deliver an address on "Service;" and Mr. Walter Hole has been "booked-up" to give an address on "The Scheme for Technical Education in the Gas Industry." Succeeding, it is hoped to have an address on "The Past and Future Work of the Salesmen's Circles." This opens up a big subject; for the future work of the gas salesman bids fair to be of a still more extensive character than it is at present. However, we shall anticipate that the discussion will show in a striking fashion the appreciation of this by the salesmen. After tea, the visit to the exhibition will take place. That is the preliminary draft programme now under consideration; it is, of course, subject to modification.

The London Electricity Scheme.

The Electricity Commissioners are not having a really happy time. The work for which they were appointed does not make much progress; and the electrical Elysium which it was believed they would fashion and create appears still to be far off. The plans they propounded for composing the difficulties which surround the problem of a unifying scheme for London and the Home Counties were considered *ultra vires* the provisions of the Electricity (Supply) Act, 1919. The scheme provided for the creation of a Joint Authority, and the appointment of a Local Authorities' Committee and a Companies' Committee, to whom were to be delegated certain of the powers of the Joint Authority; and to each Committee was assigned a portion of the Joint Authority's district with independent powers. The Company undertakings applied to a Divisional Court for a writ of prohibition against the scheme being proceeded with, and also a writ of certiorari to bring the matter before the King's Bench Division. They were unsuccessful. The matter was taken to the Court of Appeal; and, in the result, Lords Justices Bankes, Atkin, and Younger have made absolute the rule for prohibition, and discharged the rule for certiorari. In other words, the Court have prohibited as *ultra vires* the provisions of the Electricity Supply Act, the scheme as propounded by the Electricity Commissioners. Their Lordships are of opinion that the Commissioners were acting without jurisdiction in delegating the powers of the Joint Electricity Authority, and that their proposals were a violation of the Act.

Alarm of the Coal Merchants.

In our issue of July 18, we referred to the circulation among householders of fresh literature as published by the Coal Merchants' Federation of Great Britain. The leaflets, as was then pointed out, have the dual object of lauding the use of smoke, dirt, and labour-promoting coal in the household, and of decrying the use of gas-heated appliances. This propaganda attests a genuine alarm on the part of the coal merchants. In our article on the subject, it was suggested that the "B.C.G.A." should deal with these circulars in counteractive leaflets. We find that the Association are not behind requirement. They have already an attractive leaflet, bearing the title of "The Alarm of the Coal Merchants," for distribution by gas undertakings where the coal circulars appear. The advantages of the gas-fire and gas-cooker are set forth clearly and tersely; and reasons are given for the banishing of the old coal-range.

Uncomfortable Reflections for Colliery Owners.

The improved position of the British coal industry has been due to the large requirements for export purposes. It has been seen that June experienced a large falling-off in the overseas demand. But there are other factors which the colliery owners

do not like. It transpires that, during the first three months of this year, the United States shipped to European countries, in competition with this country, 544,038 tons of coal. That is a substantial amount for three months; and it compares with 96,213 tons in the corresponding period of 1922. The increasing demand for coke, too, is not altogether a comfortable factor for the colliery owners.

Oil Imports.

During the first half of this year, there was a considerable falling-off in petroleum imports. The gas oil received amounted to 35,599,234 gallons, compared with 41,982,352 gallons in the first half of 1922. Illuminating oil decreased from 80,503,140 gallons in the June half of last year to 70,390,202 gallons in the first half of this year; motor spirit, from 172,966,645 gallons to 157,832,579 gallons; and fuel oil, from 203,286,042 gallons to 165,675,377 gallons. There were increases: In lubricating oil, from 34,155,420 gallons to 51,764,900 gallons; crude oil, from 94,407,119 gallons to 146,495,842 gallons; and "other sorts," from 24,914 gallons to 1,029,716 gallons. The values for the first half of the current year amounted to £17,797,246, compared with £21,367,727 in the first half of last year. The total imports in the June half of 1921 were lower than in that of either 1922 or 1923; but the total value then was £33,206,915. A significant feature of the above statistics is the rise in the imports of crude oil. This is Persian oil; and it reflects the extent to which the refining industry is being established in this country.

Oil-Boring Losses.

It was stated in the House of Commons the other evening that the total amount realized during the year ended March 31 last, by the disposal of Government buildings and plant utilized in the oil-boring experiments in this country, was £25,000. The amount reserved for interest on Exchequer advances and on administrative charges, amounted at March 31 to £104,903. The total loss on the undertaking to that date, including the interest, was approximately £678,000.

PERSONAL.

Mr. R. ELMS, Chief Adviser and Salesman in the Distribution Department of the Derby Gas Light Company, has been appointed Distribution Superintendent to the Macclesfield Corporation Gas Department.

Mr. LEONARD TRUSCOTT, who has been representing Messrs. Willey & Co., Ltd., on the North-East Coast, has resigned his position with them to take-up an appointment as representative with Mr. James Dougall, Chiswick Meter Works, and will commence his new duties early this month.

We are pleased to learn from the "Bulletin" of the British Commercial Gas Association that, at the last meeting of the General Committee, on the recommendation of the Executive, Mr. J. C. WALKER was appointed Assistant Manager of the Association, a position which he will hold in addition to remaining Secretary. All who know Mr. Walker will endorse, with us, the following remarks of the "Bulletin:" "Members will appreciate how thoroughly he deserves the title, having for many years performed the function with great distinction and in an admirably capable but unostentatious way. As the Manager's onerous work now takes him so much out of London and into the offices of the undertakings up and down the country, the burden that falls on Mr. Walker's shoulders is far from being a light one; and perhaps only those who are in close and constant association with him realize the magnitude of the work that he accomplishes. But everyone knows its excellence: and everyone knows that there is only one thing of which he is totally incapable—he cannot make an enemy."

At the recent annual meeting of the Governors of the East Sussex Hospital—presided over by Viscount Goschen, C.B.E.—the Committee presented their 83rd annual report, in the course of which they said: "The Committee once again have to record their deep gratitude for the splendid and generous services of Mr. Alfred Blackman and Mr. C. F. Botley, who, as the Acting Sub-Committee, have had charge of the many intricate details of engineering and technical design in the new buildings. This has taken much of their valuable time, which they have freely given." This good work received further recognition at a later stage of the proceedings, when Major Mullens proposed a vote of thanks to both gentlemen, who, he said, had, by spending so much time superintending the work, undoubtedly saved the hospital many thousands of pounds. At his request, the Countess Brassey presented Mr. Blackman and Mr. Botley each with a handsome silver salver, which had been subscribed for by the Committee and the staff. The inscriptions stated that they were in recognition of "services in superintending the erection of the new building, 1921-1923."

ELECTRICITY SUPPLY MEMORANDA.

IT is clear that the position of affairs in connection with domestic electrical apparatus is not what the men of that industry would like them to be. There are three sections of the industry concerned in this condition of affairs—the electricity suppliers, the manufacturers of electric appliances, and the retailers. All three interested parties complain of the state of the domestic trade for purposes other than lighting; and they accuse each other of being slothful in business, and anything but fervent in spirit in helping forward this branch of the work. But we are convinced there is little reason in this. It is the public who should be blamed—if actually blameworthy. And the public are not. They cannot be expected to have recourse to methods of domestic operation that are more uneconomical in first cost, installation, and over-all running than other methods, and moreover less reliable, and for some purposes more time-absorbing in performance. Electricity supply men know that these difficulties in the path of advance are very real; the manufacturers know by the numerically poor state of the orders they receive that there is not much business in these things, even after their strenuous work in advertising and exhibiting through a number of years; and the electrical contractors are getting weary of, and peevish over, a combination of circumstances that to them is most unsatisfactory. They censure the manufacturers for an insufficiency of enterprise; and they assert the same of the supply undertakings. The latter, too, they declare are robbing them of their legitimate living by the adoption of hiring-out and hire-purchase systems. But if we are to believe the manufacturers' lament as to the thin state of business in these lines, the hiring-out and hire-purchase systems are not doing much to stimulate the demand for domestic goods. Electrical appliances, installations, and B.Th.U. supplied electrically must be very much cheaper, so as to show something of an equality with other methods of doing the same work. Reliability, too, must also have equality; and so must the cost of renewals, and general efficiency in service. There is more in this question than can be concentrated in, and covered by, the work of the oven of an electric cooker; but there are few electricians with sufficient frankness to confess this.

Who is to Blame?

The Contractor's Plaint.

However, electricians profess a belief in the all-round superiority of domestic electric appliances over all other methods. No one would expect a man in the electrical service, and receiving its pay, to make any other profession. But that does not alter the facts of the case. These are present—solid and unyielding. Nevertheless, an electrical contractor, in what are described as "comments and criticisms" on the general subject, says in "Electrical Industries" that the sales of domestic electric appliances are not what they ought to be. He is in a position to know; and what he says is but a confirmation of what is asserted in other quarters. We hear voices from all parts deploring the slow movement. Instead of all the propaganda work having put more energy and volume into the stream of adoption, he states that the sales in April were lower than they have been during the last two years. Having said this, he has recourse to postulation and stale assertion. "The various advantages claimed for electric power can," he declares, "be equally claimed for electric cooking and heating, while economy is common to both." We have on several occasions shown, by the aid of the quantity of energy used and asserted efficiencies, that this is incorrect; and therefore this time we will not re-open the subject. But if the statement be true, why do not those advantages override the impediments that are alleged to be the cause of slow and meagre adoption? We cannot see how anything can stop genuine advantage being the predominant factor in enlarging the domestic electrification business. Apparently, however, the reality of those "advantages" does not weigh with sufficient force with electrical men as to cause them to believe that the "advantages" alone can carry domestic electrification forward. They are invariably looking outside them for other reasons which, in their opinion, block the way. The public do not care what the electricity supply authorities think or do; and unknown to them as having any part in the piece are the manufacturers of the appliances and the contractors. Satisfied as to the declared advantages, the public, or a section of them, would have the appliances. The electrical contractor critic appears to be confident that there is not adequate selling force and proper organization behind the domestic appliance section of the industry. For support, he refers to the recent agitation in the daily Press over the "danger" of gas appliances; and, "when articles were appearing asking for something safer and better, the electrical industry calmly watched the opportunity pass without making any real movement in the matter." Singular as it may seem to our electrical friends, one of the most flourishing times the gas industry has had in the fixing of new gas appliances has been during the past year or two—covering the period of that particular agitation. No other comment need be made upon the critic's complaint of a want of enterprise in the electrical industry. Those who wrote the articles in the daily Press are few in number; the experienced gas consumers who have used gas properly and without mishap—some for very many years—are counted by the million. If the critic has any sense of proportion and the meaning of facts, he will see

indicated by the experiments. Prof. Bone gives expression to the hope that these possibilities will be thoroughly explored at home, and not be left to foreign organizations, who will probably not be slow to seize upon them. We trust that these aspirations will be fulfilled. All too often our men of science have commenced work, and carried it to a point where unaided they could not well go farther; and then the potentialities of their achievements have been realized in other lands, with the inevitable result. There is no intention on the part of Prof. Bone to relinquish the work; but unassisted it has limits. Let us give an example in his own words: "We are approaching the safety "limits of the bomb [used in these high-pressure experi- "ments]. If funds were forthcoming for the construction "of a new bomb, with the necessary accessories, to enable "us to work at still higher initial pressures than we have "hitherto employed, we should be able to study the effects "of subjecting small quantities of diluent gases to the com- "bined influence of exceedingly high temperatures and in- "tensive research." In the interests of science, we add our hope to that of Prof. Bone that it may be possible for him and his devoted assistants to pursue this aspect of his important research. Want of funds should not be permitted to close the door upon research which has reached the stage disclosed in the discourse, when the men are still available who have done so much, and are the only ones who have complete and intimate knowledge of the details of the work which has resulted in present achievement.

Gas Manufacture and Sales in 1922.

The returns relating to statutory gas undertakings are increasing in value year by year. This time we can congratulate the responsible department at the Board of Trade in issuing Part I.—that dealing with the manufacturing and sales operations of all statutory gas concerns—so near to the period to which the statistics refer. It applies to the year 1922. This is a distinct improvement. There is substantial evidence, too, that progressively the returns will have more and more interest, in view of the fact that, though figures cannot yet be given as to the total sale of therms, we shall, as the years pass, get closer and closer to the time when aggregate data can be supplied. The total figures as to gas make and consumption can for the present only be returned in cubic feet; and those cubic feet may vary in potential thermal value by any percentage up to (say) 40, for certain undertakings may supply gas of 560 B.Th.U., and others fall as low as 400 B.Th.U. This condition of things the Board of Trade cannot possibly rectify until the change to the scientifically correct basis has been completely made, and all statutory undertakings have a year's working data to present with the therm system in operation. Of course, therm statistics are in the returns for individual gas undertakings; but the period of transition —owing to the fundamental character of the elements constituting the change—must necessarily be a long one. Part II. of the returns, relating to financial matters, will probably be published soon.

Turning to the total statistics as presented in Part I., progress in manufacturing efficiency and commercial expansion is divulged which—having in view the industrial and trade depression last year, and the consequent unemployment—is satisfactory; and the additional new consumers, with the gradual improvement in trade, supply good promise for the future. As to the materials used in the manufacture of gas, it is observed that the quantity of coal carbonized by the statutory undertakings in 1922 was 15,907,095 tons, or an increase of 131,399 tons compared with 1921. But there was a decrease in the use of coke and oil for water-gas making. The amount of coke gasified for this purpose was 1,057,909 tons, or a decrease of 196,213 tons; and the oil used amounted to 46,145,160 gallons, or a quantity smaller by 5,586,332 gallons. There is no discrimination between blue and carburetted water gas; but, calculating over the whole quantity of water gas produced, the average consumption of oil is 1·05 gallons per 1000 c.ft. The coal gas made amounted to 201,963,546,000 c.ft., or an increase of 7,445,399,000 c.ft. The water gas manufactured totalled to 43,946,129,000, or a reduction of 5,948,587,000 c.ft. The two figures—coal gas and water gas—make 245,909,675,000 c.ft.; the water gas representing rather less than 18 p.ct. of the aggregate make of the two gases. However, the 245,909,675,000 c.ft. do not represent the total of the gas produced for town supply. There is the "other gas." But we suggest to the Board of Trade that they should relinquish their efforts to discriminate between coal and water gas and "other gas," because the "other gas" only leads to confusion and inaccuracy. All that it is necessary to do is to make a separate entry of acetylene gas; put a footnote to the coal gas made stating the total quantity of coke-oven gas included in the figure; and then make a judicious allocation between coal and water gas for the remaining production. For example, we see under "other gas" that the estimated quantity of gas made by steaming in the Bradford vertical retorts is included. Why Bradford, when there are to-day numerous undertakings practising steaming in vertical retorts, and the extra gas so made is no doubt included under coal gas? Then "mixed coal and water gas" is mentioned. No doubt this is gas made by one of the combined systems —probably the Tully; and yet Tully gas is specifically referred to in other items. If all the gas so made were included, the figures would be of a totally different character. As presented, they are incomplete. In these cases we would suggest that the gas engineers should be asked to estimate the proportions of coal and water gas in the total; or where it is a matter of complete gasification of coal, we cannot see why the figures should not be added to the coal gas. Anyway, the figures for "other gas" are useless for the reasons indicated. The data show that 3,635,678,000 c.ft. of coke-oven gas were purchased by authorized gas undertakings. However, we finally come to the figure of 252,070,321,000 c.ft. as the quantity of gas produced for town supply during the year; and that is an increase on 1921 of 3,050,589,000 c.ft. Two other figures in this connection. We calculate that the average production of gas per ton of coal used in 1922 was 12,700 c.ft.; while in 1921, the production was 12,330 c.ft.—an average increase per ton of 370 c.ft. over the nearly 16 million tons used. There is no question that there is greater efficiency in our carbonizing practices to-day; and latterly, as they have become cheaper, higher grade coals have been purchased. On the other hand, if the comparison could be made in therms, we should know the definite value of the increased production.

Passing from manufacture to sales, the total quantity of gas sold by the statutory undertakings of Great Britain during the year was 232,602,789,000 c.ft.—an increase of 3,525,677,000 c.ft. There was a decrease in the consumption by prepayment consumers—a reflection of the considerable amount of unemployment that existed in 1922—but the increased consumption by the ordinary consumers and the public lamps wiped that out, and gave the extension of business of nearly 3526 million c.ft. The consumption by the prepayment consumers was 78,224,063,000 c.ft., or 2,061,595,000 c.ft. less than in 1921. The sales to ordinary consumers ascended to 146,174,788,000 c.ft.—an increase on 1921 of 4,406,756,000 c.ft.; and public lamps drew upon the mains to the extent of 8,203,938,000 c.ft.—an increase of 1,180,516,000 c.ft. These figures are illuminating; as are others when prospects are under examination. We observe that the number of ordinary consumers at the end of 1922 was 3,535,137—an increase of 47,047. The number of prepayment consumers was 4,137,009—an increase of 65,789. The two increases added together give the gas industry of Great Britain in the one year additional connections numbering 112,836—making the total 7,672,146. If it is assumed that each connection represents an average of five members of the population, we find that gas renders service to no less than 38,360,730 of the total population. This is a proportion of which we may be proud, and yet on practically every one of those connections there is room for the further use of gas. It is also observed that the length of mains is now 40,231½ miles—an increase in the year of 683¾. The average consumption in 1922 per ordinary consumer was 41,349 c.ft., and per prepayment consumer 18,908 c.ft.

As to secondary products, it has been seen that 131,399 tons more coal were carbonized in 1922 than in 1921. It is not astonishing, therefore, to find that the production of coke increased by 70,453 tons to 10,475,155 tons; but it is surprising to notice that the yield of tar increased by no less than 9,394,059 gallons to 169,770,531 gallons. Can anyone explain the reasons for this extra yield of close upon 9½ million gallons, using only an extra 131,399 tons of coal? But another surprise is that the production of sulphate of ammonia by the statutory undertakings fell by 2606 tons to 113,373 tons, despite the greater quantity of coal carbonized. There are things which statistics alone cannot explain; and elucidation has to be sought among such factors as conditions in the markets. This is probably one of them.

Equity of Meter and Stove Rents.

In discussing, in our issue of July 18, the Edinburgh case, in which the legality of the policy of the Gas Department respecting the lending-out of appliances free or at inadequate rents was the point at issue, it was distinctly mentioned that we did so upon its individual merits, without entering (as we have done on previous occasions) into the question of the general principles that should govern policy in dealing with gas-consuming appliances. But now, in view of an article on the subject that appears in other columns from Mr. George Evetts, M.Inst.C.E., we will say this: That inasmuch as, if the charges attaching to meters or gas-consuming appliances are not realized by direct rentals, they must be provided in the price of gas, the most equitable policy is to charge adequate rents for both meters and gas-consuming appliances, having regard to the large diversity there is in the consumptions of different consumers. In such cases, however, as Edinburgh, where a flourishing business has been built-up along a certain line of policy, it would be ridiculous to alter it, and so upset a system to which the consumers are accustomed, and which has worked well to the general advantage—just as it has, if not always equitably, in connection with the prepayment system of gas supply. One cannot uproot an established policy of the kind without inflicting damage. Of course, the object of the Edinburgh traders was to get the policy of the Gas Department abolished, and to transfer the business, if possible, to their own hands. But the realizing and maintenance of the best efficiency with gas appliances is a matter for the specialist; and this is being recognized more and more—not only by gas undertakings themselves, but by the central powers at Westminster. There is evidence of this in the Gas Regulation Act; there is recognition of it in the report of the Departmental Therm Charges Committee; and there was again evidence of it in the suggestions for consideration that emanated from the Board of Trade Conference on the question of safety in gas distribution and use. There is very good reason why those who really cultivate the gas business, and have an interest in the use of the appliances after installation, should be the ones to have a hand in their selection, and a voice in the correctness of their installation, and not tradesmen who, after the sale of an appliance and its fixing, have no more concern in it. The rectification of any deficiencies there are in it, more often than not falls upon the gas suppliers; otherwise, in the eyes of the consumer, it is not the appliance that is at fault, but either the quality or the pressure of the gas. The decision in the Edinburgh case has, Mr. Evetts says, given universal satisfaction; and we believe he is right. Nothing to the contrary has been heard; and we cannot see how any one in the industry could uphold the proposition that the administrators of a gas undertaking should be deprived of discretionary power in respect of the best policy to adopt and pursue in developing the gas business in any locality.

In his article, Mr. Evetts takes us beyond the question as to whether the Edinburgh Corporation Gas Department were acting *ultra vires* in what they were doing in respect of the supply of gas appliances and running their showrooms. He enters both argumentatively and from the points of view of practical finance and of equity into the question of charging rents; and in every respect we are with him. Very broad grounds offer sufficient justification without going into details. In the case of ordinary meters, now that the characteristics of gas supply have changed so considerably, meter-rents should be levied, and the charges should not be included in the price of gas per therm or per 1000 c.ft. To do this is totally unfair to the consumer with any diversity of demand, and a large total consumption, because the greater his consumption, the more he pays for the meter; whereas there are other people with meters fixed who are sparing in their use of gas, and whose consumption is altogether inadequate to supply compensation, at the average figure included in the simple price charged them for gas, for the various costs appertaining to the meter. It is inequitable that the good consumer should, through the averaging of meter charges in the price of gas, pay part of those incidental to the supply of the consumer of slender patronage. The point has become accentuated since some householders have "all-gas" kitchens, and perhaps several fires; while others may only use the gas for (say) lighting purposes. Some of the latter do not, through their meagre consumption in these days of incandescent burners, pay the whole of the charges involved in the provision of the supply to them. There are those people, too, who may use the service and the meter merely as a stand-by to some other method of lighting of a less reliable character. A meter-rent is some protection to the undertaking in such cases; but the operation of a stand-by clause (as has been generally adopted in modern legislation) is better still. Mr. Evetts points out that there is some palliation of inequity as between the good and the bad consumer where meter-rents are not charged, by the operation of a system of discounts. That is true, but only within limits, which limits are exceeded by the consumers who use gas (say) merely for lighting, or the meter and service solely for stand-by purposes. Without special powers of charge and a system of discounts, such extreme conditions as are met with in respect of gas consumption in these days cannot be negotiated with rigid equity to all concerned.

Rents for gas-consuming appliances raise very similar considerations. Where the charges pertaining to the appliances are included in the price of gas, it is found that some of the latter are used freely; others with a frugality that defies the appropriate charges being provided by the amount of gas consumed. The former will be productive; the latter will not be. The same inequality results from the supply of appliances rent free, as in the case of meters. There are large consumers of gas (Mr. Evetts instances factory owners) who may not require such appliances; and yet their consumption may greatly exceed that of a householder with certain gas-consuming appliances that have been supplied to him rent free. Unless the factory owner is allowed a discount, he will be providing, in the total sum that he pays, some of the cost incidental to the provision of rent-free cooking or heating appliances for householders. This would be inequitable. Then, again, rent-free gas appliances must have the effect of preventing people purchasing appliances outright, or acquiring them on the hire-purchase system. This is a distinct disadvantage to the gas undertaking for more reasons than one—and an important one is that such purchases save capital expenditure, and, unlike the appliances out on hire, the purchased ones cannot be returned. This is a benefit. We will not follow the details of Mr. Evetts' contribution. But this we will say, that no one who studies the article would change from the rental system for meters and gas appliances to their free supply, if equity as between consumer and consumer has any place among the considerations upon which decision is made. Those who have free meters in operation might be inclined to impose rents, and at the same time reduce the price of gas; but where appliances have been supplied free (though the charges are included in the price of gas), we should be loth, in view of the damage that might be occasioned, to advise a change to the policy of direct rents, notwithstanding it is the correct and the equitable one.

The Patched Smoke Abatement Bill.

The promise of the Government to introduce a "new" Smoke Abatement Bill has not been fulfilled. It is the measure of the late Government, with a few patches on it—particularly with a view to pleasing Sheffield. It is a curious thing that Government after Government appear to dread to deal with this matter in a statesmanlike and constructive manner. They probably fear that, if they do so, they will meet with some terrible calamity. They treat the domestic chimney as sacrosanct, despite the cumulative influence of those chimneys in polluting the atmosphere, and introducing conditions unhealthy for human and other life. What is wanted is more legislative enterprise in this matter, so as to empower local authorities to do something progressive (without at present aiming at finality) in limiting the burning of crude bituminous coal for household purposes. To our mind, there is not, for example, the slightest reason why section 4 of the new Bill should contain the words "other than private dwelling-houses," when conferring powers upon the appropriate local governing bodies to make bye-laws requiring the provision in new buildings of such arrangements for heating as are calculated to prevent or reduce the emission of smoke. The exclusion of new private dwellings is unnecessary. The Government in this Bill have, as did their predecessors, concentrated their attention upon industries. They have increased the penalties imposed by the Public Health Act of 1875 for the emission of smoke (notwithstanding that it is

not "black") from chimneys other than those of private dwelling-houses. Again, smoke is to include "soot, ash, grit, and gritty particles." There is no objection to the suppression of these public annoyances. In these times there is no occasion for even industrial chimneys being a nuisance to a neighbourhood, unless circumstances are very exceptional. Consideration has been given to the representations of the steel industry, with the result that it is proposed that section 334 of the Public Health Act is to have effect as if there were included among the processes specified in that section those of reheating and annealing, hardening, forging, converting, and carburizing iron and other metals. But present inclusion in the section named does not necessarily mean permanence; for there is a proviso that the Minister of Health may, by Provisional Order, at any time after the expiration of five years from the passing of the Act, exclude from the application of the section named any processes specified in that section as amended by this sub-section, so far as smoke nuisances are concerned.

The Bill supplies abundant scope for contention before penalties are imposed. It is provided that, in any proceedings for sending forth smoke from a chimney in such quantity as to be a nuisance, it shall be a defence for the person charged to show that he has used the best practicable means for preventing the nuisance, "having regard to the cost and to local conditions and circumstances." If the Bill passes, we shall expect to see a large number of occupants of this ground of defence. And again, in any case in which bye-laws for the purpose have been made by the local authority, the emission (during such period as may be prescribed by the bye-laws) of black smoke of such density and volume as may be prescribed, will allow the presumption, until the contrary is proved, that such emission is a nuisance. We foresee here a beautiful chaos as to the prescriptions regarding "black" smoke, in respect of the density and volume that constitute a nuisance. It appears that the Government do not consider the Ministry of Health are the proper authority to fix standards for the measurement of black smoke. Nevertheless, we imagine the Ministry of Health have resources that local authorities do not possess; and yet what the Ministry of Health cannot, or will not, do local authorities are expected to do—local authorities perhaps constituted of men personally interested. We can see a variety of prescriptions coming along from different districts, with considerably varying degrees of densities and volumes of black smoke considered to constitute a nuisance. Any local authority "may," and shall if so required by the Minister of Health, make bye-laws for the purpose of dealing with smoke. In connection with which, one of the duties—not obligatory, but permissive—of the Minister of Health is that he "may," after a public inquiry, and after consultation with any local authorities or interests concerned, make Orders extending the list of noxious or offensive gases mentioned in section 27 of the Alkali Works Regulation Act, and the list of works in the first schedule to that Act. Local authorities who neglect to carry-out their duties in respect of smoke nuisances, or who fail to make bye-laws when requested to do so by the Minister of Health, will find, if the Bill passes, that the latter may authorize the county council to perform the duties, and the expenses of them will have to be defrayed by the local authority.

We cannot see that the Bill does much more than the previous one towards producing any real solution of the great problem of smoke abatement, which problem has grown very much in magnitude since the passing of the Public Health Act of 1875. This fact appears to have been overlooked by the authors of the proposed legislation in designing the additional punitive measures against industry. These may be highly desirable; but they do not show originality, nor do they reveal new legislative enterprise, or genuine constructive desire, in respect of this important problem.

Well Done, Hornsey!

The Hornsey Gas Company, of which Mr. J. W. Buckley is the Engineer and General Manager, will again lead in the London area in the matter of price per therm, from the September meter readings. The Directors last Friday resolved to reduce the charge from 8½d. to 8d. At 8½d., they were in line with the South Metropolitan Company, and only 0·1d. in front of the Gas Light and Coke Company. Now they will be, unless further movement is made, 0·5d. lower than the South Metropolitan and 0·6d. below the Gas Light Company. And Hornsey has not the advantage of water carriage.

At the National Gas Exhibition.

The arrangements are gradually shaping themselves for the joint meeting of members of the Salesmen's Circles at the National Gas Exhibition in Birmingham; and in some quarters there is hope that the Junior Gas Associations may take part in the event. Anyway, that is a matter for discussion and decision. A provisional programme has been arranged. Saturday, Sept. 22, is the appointed day. The idea is to have lunch at 1 o'clock; and then at 2.15 to hold a business meeting. At this, Mr. F. W. Goodenough, the Executive Chairman of the "B.C.G.A.," has promised to deliver an address on "Service;" and Mr. Walter Hole has been "booked-up" to give an address on "The Scheme for Technical Education in the Gas Industry." Succeeding, it is hoped to have an address on "The Past and Future Work of the Salesmen's Circles." This opens up a big subject; for the future work of the gas salesman bids fair to be of a still more extensive character than it is at present. However, we shall anticipate that the discussion will show in a striking fashion the appreciation of this by the salesmen. After tea, the visit to the exhibition will take place. That is the preliminary draft programme now under consideration; it is, of course, subject to modification.

The London Electricity Scheme.

The Electricity Commissioners are not having a really happy time. The work for which they were appointed does not make much progress; and the electrical Elysium which it was believed they would fashion and create appears still to be far off. The plans they propounded for composing the difficulties which surround the problem of a unifying scheme for London and the Home Counties were considered *ultra vires* the provisions of the Electricity (Supply) Act, 1919. The scheme provided for the creation of a Joint Authority, and the appointment of a Local Authorities' Committee and a Companies' Committee, to whom were to be delegated certain of the powers of the Joint Authority; and to each Committee was assigned a portion of the Joint Authority's district with independent powers. The Company undertakings applied to a Divisional Court for a writ of prohibition against the scheme being proceeded with, and also a writ of certiorari to bring the matter before the King's Bench Division. They were unsuccessful. The matter was taken to the Court of Appeal; and, in the result, Lords Justices Bankes, Atkin, and Younger have made absolute the rule for prohibition, and discharged the rule for certiorari. In other words, the Court have prohibited as *ultra vires* the provisions of the Electricity Supply Act, the scheme as propounded by the Electricity Commissioners. Their Lordships are of opinion that the Commissioners were acting without jurisdiction in delegating the powers of the Joint Electricity Authority, and that their proposals were a violation of the Act.

Alarm of the Coal Merchants.

In our issue of July 18, we referred to the circulation among householders of fresh literature as published by the Coal Merchants' Federation of Great Britain. The leaflets, as was then pointed out, have the dual object of lauding the use of smoke, dirt, and labour-promoting coal in the household, and of decrying the use of gas-heated appliances. This propaganda attests a genuine alarm on the part of the coal merchants. In our article on the subject, it was suggested that the "B.C.G.A." should deal with these circulars in counteractive leaflets. We find that the Association are not behind requirement. They have already an attractive leaflet, bearing the title of "The Alarm of the Coal Merchants," for distribution by gas undertakings where the coal circulars appear. The advantages of the gas-fire and gas-cooker are set forth clearly and tersely; and reasons are given for the banishing of the old coal-range.

Uncomfortable Reflections for Colliery Owners.

The improved position of the British coal industry has been due to the large requirements for export purposes. It has been seen that June experienced a large falling-off in the overseas demand. But there are other factors which the colliery owners

do not like. It transpires that, during the first three months of this year, the United States shipped to European countries, in competition with this country, 544,038 tons of coal. That is a substantial amount for three months; and it compares with 96,213 tons in the corresponding period of 1922. The increasing demand for coke, too, is not altogether a comfortable factor for the colliery owners.

Oil Imports.

During the first half of this year, there was a considerable falling-off in petroleum imports. The gas oil received amounted to 35,599,234 gallons, compared with 41,982,352 gallons in the first half of 1922. Illuminating oil decreased from 80,503,140 gallons in the June half of last year to 70,390,202 gallons in the first half of this year; motor spirit, from 172,966,645 gallons to 157,832,579 gallons; and fuel oil, from 203,286,042 gallons to 165,675,377 gallons. There were increases: In lubricating oil, from 34,155,420 gallons to 51,764,930 gallons; crude oil, from 94,407,119 gallons to 146,495,842 gallons; and "other sorts," from 24,914 gallons to 1,029,716 gallons. The values for the first half of the current year amounted to £17,797,246, compared with £21,367,727 in the first half of last year. The total imports in the June half of 1921 were lower than in that of either 1922 or 1923; but the total value then was £33,206,915. A significant feature of the above statistics is the rise in the imports of crude oil. This is Persian oil; and it reflects the extent to which the refining industry is being established in this country.

Oil-Boring Losses.

It was stated in the House of Commons the other evening that the total amount realized during the year ended March 31 last, by the disposal of Government buildings and plant utilized in the oil-boring experiments in this country, was £25,000. The amount reserved for interest on Exchequer advances and on administrative charges, amounted at March 31 to £104,903. The total loss on the undertaking to that date, including the interest, was approximately £678,000.

PERSONAL.

Mr. R. ELMS, Chief Adviser and Salesman in the Distribution Department of the Derby Gas Light Company, has been appointed Distribution Superintendent to the Macclesfield Corporation Gas Department.

Mr. LEONARD TRUSCOTT, who has been representing Messrs. Willey & Co., Ltd., on the North-East Coast, has resigned his position with them to take-up an appointment as representative with Mr. James Dougall, Chiswick Meter Works, and will commence his new duties early this month.

We are pleased to learn from the "Bulletin" of the British Commercial Gas Association that, at the last meeting of the General Committee, on the recommendation of the Executive, Mr. J. C. WALKER was appointed Assistant Manager of the Association, a position which he will hold in addition to remaining Secretary. All who know Mr. Walker will endorse, with us, the following remarks of the "Bulletin:" "Members will appreciate how thoroughly he deserves the title, having for many years performed the function with great distinction and in an admirably capable but unostentatious way. As the Manager's onerous work now takes him so much out of London and into the offices of the undertakings up and down the country, the burden that falls on Mr. Walker's shoulders is far from being a light one; and perhaps only those who are in close and constant association with him realize the magnitude of the work that he accomplishes. But everyone knows its excellence: and everyone knows that there is only one thing of which he is totally incapable—he cannot make an enemy."

At the recent annual meeting of the Governors of the East Sussex Hospital—presided over by Viscount Goschen, C.B.E.—the Committee presented their 83rd annual report, in the course of which they said: "The Committee once again have to record their deep gratitude for the splendid and generous services of Mr. Alfred Blackman and Mr. C. F. Botley, who, as the Acting Sub-Committee, have had charge of the many intricate details of engineering and technical design in the new buildings. This has taken much of their valuable time, which they have freely given." This good work received further recognition at a later stage of the proceedings, when Major Mullens proposed a vote of thanks to both gentlemen, who, he said, had, by spending so much time superintending the work, undoubtedly saved the hospital many thousands of pounds. At his request, the Countess Brassey presented Mr. Blackman and Mr. Botley each with a handsome silver salver, which had been subscribed for by the Committee and the staff. The inscriptions stated that they were in recognition of "services in superintending the erection of the new building, 1921-1923."

ELECTRICITY SUPPLY MEMORANDA.

IT is clear that the position of affairs in connection with domestic electrical apparatus is not what the men of that industry would like them to be. There are three sections of the industry concerned in this condition of affairs—the electricity suppliers, the manufacturers of electric appliances, and the retailers. All three interested parties complain of the state of the domestic trade for purposes other than lighting; and they accuse each other of being slothful in business, and anything but fervent in spirit in helping forward this branch of the work. But we are convinced there is little reason in this. It is the public who should be blamed—if actually blameworthy. And the public are not. They cannot be expected to have recourse to methods of domestic operation that are more uneconomical in first cost, installation, and over-all running than other methods, and moreover less reliable, and for some purposes more time-absorbing in performance. Electricity supply men know that these difficulties in the path of advance are very real; the manufacturers know by the numerically poor state of the orders they receive that there is not much business in these things, even after their strenuous work in advertising and exhibiting through a number of years; and the electrical contractors are getting weary of, and peevish over, a combination of circumstances that to them is most unsatisfactory. They censure the manufacturers for an insufficiency of enterprise; and they assert the same of the supply undertakings. The latter, too, they declare are robbing them of their legitimate living by the adoption of hiring-out and hire-purchase systems. But if we are to believe the manufacturers' lament as to the thin state of business in these lines, the hiring-out and hire-purchase systems are not doing much to stimulate the demand for domestic goods. Electrical appliances, installations, and B.Th.U. supplied electrically must be very much cheaper, so as to show something of an equality with other methods of doing the same work. Reliability, too, must also have equality; and so must the cost of renewals, and general efficiency in service. There is more in this question than can be concentrated in, and covered by, the work of the oven of an electric cooker; but there are few electricians with sufficient frankness to confess this.

Who is to Blame?

The Contractor's Plaint.

However, electricians profess a belief in the all-round superiority of domestic electric appliances over all other methods. No one would expect a man in the electrical service, and receiving its pay, to make any other profession. But that does not alter the facts of the case. These are present—solid and unyielding. Nevertheless, an electrical contractor, in what are described as "comments and criticisms" on the general subject, says in "Electrical Industries" that the sales of domestic electric appliances are not what they ought to be. He is in a position to know; and what he says is but a confirmation of what is asserted in other quarters. We hear voices from all parts deploring the slow movement. Instead of all the propaganda work having put more energy and volume into the stream of adoption, he states that the sales in April were lower than they have been during the last two years. Having said this, he has recourse to postulation and stale assertion. "The various advantages claimed for electric power can," he declares, "be equally claimed for electric cooking and heating, while economy is common to both." We have on several occasions shown, by the aid of the quantity of energy used and asserted efficiencies, that this is incorrect; and therefore this time we will not re-open the subject. But if the statement be true, why do not those advantages override the impediments that are alleged to be the cause of slow and meagre adoption? We cannot see how anything can stop genuine advantage being the predominant factor in enlarging the domestic electrification business. Apparently, however, the reality of those "advantages" does not weigh with sufficient force with electrical men as to cause them to believe that the "advantages" alone can carry domestic electrification forward. They are invariably looking outside them for other reasons which, in their opinion, block the way. The public do not care what the electricity supply authorities think or do; and unknown to them as having any part in the piece are the manufacturers of the appliances and the contractors. Satisfied as to the declared advantages, the public, or a section of them, would have the appliances. The electrical contractor critic appears to be confident that there is not adequate selling force and proper organization behind the domestic appliance section of the industry. For support, he refers to the recent agitation in the daily Press over the "danger" of gas appliances; and, "when articles were appearing asking for something safer and better, the electrical industry calmly watched the opportunity pass without making any real movement in the matter." Singular as it may seem to our electrical friends, one of the most flourishing times the gas industry has had in the fixing of new gas appliances has been during the past year or two—covering the period of that particular agitation. No other comment need be made upon the critic's complaint of a want of enterprise in the electrical industry. Those who wrote the articles in the daily Press are few in number; the experienced gas consumers who have used gas properly and without mishap—some for very many years—are counted by the million. If the critic has any sense of proportion and the meaning of facts, he will see

something in this statement which will show him the foolishness of the writers to whom he refers, and the magnitude of the electrical task in dethroning the good experience of millions of users of gas appliances.

The Semi-Mystery. The electrical contractor critic solemnly expresses the opinion that "until the semi-mystery surrounding electric cooking and various domestic appliances is dispersed by a knowledge of their simplicity and economy, electric cooking will never be popular." We will not say anything about the "simplicity" of the electric cooker, except by comparison. Gas cookers have no heating elements as known in electric cookers, no fuses, and no wires, and everything about them is of a hardy nature, which is necessary in kitchens where laboratory treatment is not as a rule found. As to the economy, fancy associating economy with the electric hotplate, when we know that on the hotplate of a gas-cooker something like four-fifths of the heating work in an ordinary kitchen is performed. Again, just imagine economy being associated with the electric fire! And if imagination can stand the strain, just consider the electric water-heater being associated with economy in either price or time. Comparisons of the kind must be relative to some other system of carrying out the same operations; and we are content to have working comparison made with gas. But with all the advantages attributed by the electrical contractor to electric cooking, they appear to be altogether ineffective without assistance; for he says that occasional advertisements are little good. We are not surprised, though the fact remains that were the advantages of the proclaimed high order of which electricians speak, there would be no need for newspaper advertising; the electric cookers would advertise themselves, and the "semi-mystery" of which the electrical contractor speaks would have long since died a natural death by the full flow of experience and knowledge. Electric cooking is not a new thing; and it ought not to be treated and spoken of as such. Further, as to the "semi-mystery," the houses of electrical men ought not to be places where anything of the kind resides so far as electrical operation goes; but we have heard of cases where, not because of "semi-mystery," but because of practical experience, the supreme heads in the management of the households of electrical men have discarded electric cooking and reverted to the use of the gas-cooker. However, the critic is fully convinced that the heating and cooking section of the electricity industry is badly organized. But towards the end of his "comments and criticisms," we find a bunch of reasons for his opinions. First, we read that retailers have little faith in pulling-off an order of any size, as the odds are distinctly in favour of the client ultimately buying direct from the manufacturers; secondly, we notice that retailers and contractors are discouraged by so many supply companies furnishing apparatus on hire-purchase or other advantageous terms; and, thirdly, the hiring-out and hire-purchase systems seem to be the things that are grinding into his retailing soul. "The contractor," we read, "cannot afford to fix apparatus free of charge, and one cannot but agree that a man is a fool to buy a thing he can hire for a small sum per annum." We fully concur; but the fact must be recognized that the supply undertakings must conduct their business in a way that will, in their opinion, develop it to the best advantage. They must consider their own interests before those of the retailers. The electrical contractor, however, need not worry himself overmuch, seeing that the manufacturers are not in a state of jubilance as to the amount of business they are getting in this way; and a Committee of the Municipal Electrical Association have not found such a demand for domestic electrical appliances that they could go forward with a scheme for co-operative bulk purchase.

Electric Geysers. Gas geysers are very popular, and have received large installation. By their aid, the members of a family can follow each other in having a hot bath within a few minutes of the bathroom being vacated; and this with 12 to 15 gallons of hot water per bath. The electrical appliance makers are constantly trying to bring out a geyser that will compete with gas; but they always meet two inflexible difficulties—the cost of electrical heat units, and the slowness of providing a decent bath of hot water. The "Heatrae" geyser has been produced by Electric Fires, Ltd., of Norwich. In this the arrangements for turning on the water and switching in the elements are interlocked. The water-valve is opened by a handle; and a cam fixed at the rear of the latter engages with the tumbler switch controlling the elements. These figures are published as the results of tests of the geyser: The mean rate of flow was two pints in 45 seconds; and commencing at a temperature of 58° Fahr., the water was raised in 40 seconds to 80° Fahr.; in 100 seconds to 123°; and in 120 seconds to 127°. The efficiency of the apparatus, in B.Th.U., was found to be from 97 to 99·5 p.ct. We should like to know more as to the details of the tests; but meantime those who care for arithmetical exercises can calculate how long one would have to wait for a bath of 15 gallons at a mean rate of flow of 2 pints in 45 seconds.

Lyons' New Corner House. The "Electrical Times" has published an article headed "Lyons' New Corner House." In the opening part of it, we read that "a full detailed description of the plant for lighting, heating, cooling, ventilating and air conditioning, cooking, and so forth would occupy a fair-sized volume, We can here only give a brief general outline of the principal equipment." The article has been read carefully with the view of ascertaining whether a "brief general outline" could do justice to the "principal equipment." But the writer deals almost exclusively with the lighting arrangements. Being such an enormous catering establishment, one would imagine that the cooking apparatus would have been regarded as part of the "principal equipment." Manifestly, the writer does not so regard it, as, although it consumes gas to an extent that would satisfy a fair-sized town, he has not thought fit to notice it in any way. He does, however, mention gas. He says "the possibility of complete breakdown of supply, it will be seen, is quite negligible, and, in the circumstances, the installation of gas or oil emergency lighting, has not been insisted upon." However, it is something to have the admission that the New Corner House is one of the "best equipped" buildings in the Metropolis. This "best equipped" building includes the large gas-cooking apparatus. A list is given of "some of the principal contractors who have helped to make the New Corner House one of the best equipped buildings in the Metropolis." But we miss from the list the makers of the gas-cooking plant—the cooking which is the very basis of the big business done at this popular New Corner House. These caterers of unrivalled experience have selected gas-heated apparatus as the most suitable for their business; and they draw an extensive custom, make large profits, and pay good dividends. This is altogether opposed to the theories and superficial talk of electrical men—some of whom profess to know more about cooking than the experts of Messrs. Lyons & Co.

Electric Furnaces. In the construction of large electric furnaces, many technical difficulties have been encountered; but it is claimed that in the Wild-Barfield furnace, these have been successfully overcome. The furnaces are constructed on the unit principle, with inside or exposed heating coils. Each unit consists of a brick, 4 in. by 4 in., specially shaped so as to dovetail into its neighbours. In the face of each unit or brick are three annular channels. When the bricks forming the heating chamber are assembled, the annular channels present continuous grooves in the walls, floor, and roof, and the heating units in the form of spirals or rods are drawn through from end to end of the heating chamber or tunnel. The makers of gas-heated furnaces will be interested in the energy consumption of these furnaces. A furnace measuring 20 ft. by 12 ft. high and 12 ft. wide requires 1400 KW. per hour to maintain a temperature of 1000° C.; but the same-size furnace for non-ferrous annealing at (say) 500° C., requires 490 KW. A carburizing furnace of the same construction, measuring 24 in. by 12 in. by 12 in., is heated in one hour to 900° C., with a consumption of 11 KW.; and the furnace after the first hour, together with the work being carburized, is maintained at 900° C. with a consumption of 5·6 KW. The consumptions do not suggest economical running, even at the price of power units.

The London Electricity Scheme—A Sliding Scale. The London County Council Special Committee on Electricity Supply have been considering how best the draft scheme for Greater London can be modified with the view of meeting the objections raised to it by the London Electricity Supply Companies. A long report has been printed in the *agenda* of the County Council; and they think that the scheme now proposed will substantially meet the particular points for which the Council have throughout contended in their efforts to secure a settlement of the question. It is also understood that it is probable the Companies would be willing to accept these heads as a basis of settlement. In the first place, the scheme provides for establishing a Joint Electricity Authority for Greater London. Provided that a satisfactory sliding-scale of prices and dividends can be agreed, the London Companies are to be empowered to amalgamate and to have an extension of tenure to 1971. The undertakings, it is proposed, should then be transferred to the Joint Electricity Authority on the following terms: (1) Assets in use when the Joint Electricity Authority is constituted, to be transferred free of cost to them. (2) Assets subsequently provided by the Companies to be transferred on payment of capital expenditure less depreciation (to be provided by sinking fund). The Companies are to have financial and administrative independence, subject only to the control of the Joint Electricity Authority in regard to: (*a*) Technical development (in accordance with the agreed scheme); (*b*) disposal of surplus energy over and above that required for the united needs of the Companies concerned; (*c*) capital expenditure by the Companies, which will ultimately be repayable by the Joint Electricity Authority (*i.e.*, expenditure not entirely covered by sinking fund before 1971); and (*d*) maintenance of the assets to be transferred ultimately to the Joint Authority. The Companies to have a right of appeal to the Commissioners in regard to matters arising under any of these four latter heads. Further, the Companies are to provide sinking funds: (1) To liquidate by 1971 the value of the physical assets in use at the date when the Joint Authority is constituted, as determined on the basis of capital properly expended by the individual Companies, less depreciation; and (2) to provide for the depreciation of assets representing future expenditure. It is considered that, in view of the large measure of autonomy to be given the London Companies, their representation on the Joint

Authority should be very small. There is to be conference on the subject with the Electricity Commissioners, the London Electricity Supply Companies, and the Conference of Local Authorities owning electricity undertakings in Greater London with a view to the formulation of a scheme providing for the establishment of a Joint Electricity Authority for a Greater London Area which shall give effect to the principles set forth in the report.

THE DETERMINATION OF CARBON MONOXIDE IN VITIATED AIR.*

IN Bulletin No. XIII. published by the Lancashire and Cheshire Coal Research Association, Mr. F. S. Sinnatt (Director of Research to the Association) in conjunction with Dr. L. Slater describes methods which have been found to yield satisfactory results for the determination of carbon monoxide in the air from coal mines, the waste gases from coal and gas fires and gas-heated appliances, and the gases produced during experiments upon the oxidation of coal.

The apparatus described for the analysis of mine air containing a larger amount of carbon monoxide than 0·02 p.ct. is a modification of the original Haldane apparatus, and differs but little from that of Winmill and Graham. It has long been recognized that carbon monoxide is an essential product of the oxidation of coal; and Graham has proved that the presence of this gas, above certain normal values, in mine air may be considered an absolute indication that abnormal heating is proceeding in some part of the mine. To those who have had experience of the odour which is so characteristic of incipient heating in the goaf, it may appear that no such test as the analysis of the air is necessary to replace "nose identification;" but the gob stink tends to permeate the whole of the workings, and consequently the determination of the actual position of heating is frequently a matter of difficulty. It would appear, therefore, that rapid analysis of the air from any locality would yield a positive indication of the intensity and approximate position of the zone of heating.

For the analysis of gas where large volumes are available, and the percentage of carbon monoxide is lower than 0·02, the authors advocate the method due to Graham, in which a known volume of air to be examined is passed over heated iodine pentoxide; other gases, including hydrocarbons of the ethylene and acetylene series, which would interfere with the reaction, having been previously removed. The reaction between the carbon monoxide and iodine pentoxide results in a quantitative production of carbon dioxide and iodine according to the equation $I_2O_5 + 5CO = 5CO_2 + I_2$. The iodine produced is absorbed in a dilute solution of potassium iodide, and is finally titrated with a solution of sodium thiosulphate. To eliminate gases liable adversely to affect the iodine pentoxide with the production of iodine, the air was passed through a purifying train consisting of a wash-bottle containing a 10 p.ct. solution of bromine in potassium bromide, a further wash-bottle containing caustic potash solution, and a drying tube containing calcium chloride, powdered caustic potash, and phosphorus pentoxide. It was found, however, that the absorption of the bromine vapour by the solution of caustic potash resulted in the formation of some active volatile substance which was capable of liberating iodine when brought into contact with iodine pentoxide. This objectionable compound, it is stated, may be removed by an absorbent of the type of animal charcoal inserted at the end of the purifying train; but in order to avoid any possibility of exhaustion, it was decided to replace the bromine by fuming sulphuric acid. Exhaustive tests indicate that this reagent is efficient; and no abnormal action on the iodine pentoxide has been observed.

For the determination of carbon monoxide in the waste gases from gas-heated irons, and the exhaust gases from gas-engines, a method has been evolved which depends upon the collection of all the carbon dioxide produced after the carbon monoxide has been oxidized with iodine pentoxide. The gas is collected in a dry flask which admits of the carbon dioxide present being determined by Pettenköfer's process. If necessary, copper oxide may be used as the oxidizing agent, which yields results identical with those obtained when iodine pentoxide is employed.

* Bulletin No. XIII. of the Lancashire and Cheshire Coal Research Association—"The Determination of Carbon Monoxide in Vitiated Air." By F. S. SINNATT, M.B.E., M.Sc. (Tech.), F.I.C., M.I.Min.E., and L. SLATER, Ph.D., M.Sc.(Tech.), A.I.C. Published by H. F. & G. Witherby, 326, High Holborn, W.C. Price, 2s. net.

Welding of Cast Iron.—There have been described in the "Coal Age" several methods which have been developed to overcome difficulties formerly encountered in the welding of cast iron; and some of these, it is stated, are fairly successful. One method is to prepare the metal for welding, and then drill and tap the area with holes into which stud bolts are screwed. The stud bolts are left projecting out of the cast iron, and the weld is made to the cast iron and studs. By this plan the studs serve to tie the deposited metal to the cast iron. Another method is to make the weld with a non-ferrous electrode—such as bronze of certain alloy and copper nickel alloy. These metals deposit without any hard film; and if properly done, the weld will show high mechanical strength. Positive polarity in the electrode should be used for non-ferrous electrode work.

METER AND STOVE RENTS.

By GEORGE EVETTS, M.Inst.C.E.

IN the Editorial of the "JOURNAL" for July 18 (p. 302) reference is made to the result of the recent litigation in which the Corporation of Edinburgh were called upon to defend their policy and practice regarding the hiring of gas-consuming appliances, and the manner in which the finances connected therewith are treated in the accounts of the department. General satisfaction has been expressed at the decision, which resulted in a win for the Corporation on every point, and definitely establishes their right to be masters of their own house in domestic matters. It is, in fact, difficult to see how the result could have been otherwise; and wonder has been expressed in some quarters at the hardihood of the complainants, who were interested as suppliers of gas-appliances.

The complainants, or pursuers (to use the Scottish term), have failed to appreciate the great change which has come over the sales departments of gas undertakings during the past twenty years. To-day the selling of gas is completely and inextricably merged with the hiring and maintenance of the appliances. For good or ill, the gas company or department is now engaged in the consumers' houses, and is part of the consumers' domestic machinery. The suggestion that the showroom can be detached from the gas sales organization is so obviously absurd that the idea was not treated seriously.

Whatever may be said for the policy of encouraging the local gasfitter or retailer of appliances, it must not be forgotten that under the Gas Regulation Act, 1920, the gas undertaking is partly responsible for every gas appliance. With houses carcassed by an unskilled fitter, and appliances constructed on unscientific principles, it may be impossible to adapt a gas installation to 400 B.Th.U. gas where a quality of 500 B.Th.U. has previously been supplied. In these circumstances, how far will the obligation of the undertaking extend in the event of a change of declaration? In the case of hired meters and appliances, how many local tradesmen are prepared to let these appurtenances on hire, and to undertake the responsibilities of maintenance? Under the Gas Regulation Act it becomes all the more necessary that the relationship between manufacture, distribution, and consumption shall be stronger in the future than it has been in the past. It is not likely that the local fitter or selling agent wants to be troubled with an article once it has left his premises; and it is naturally to his advantage to skim the cream by selling appliances, carcassing new houses, and then virtually handing the responsibility over to the gas undertaking for the future behaviour of the installation. This criticism is not intended to cast any aspersion on the many skilled fitters throughout the country, or on the many admirable working agreements which exist between private tradesmen and gas undertakings. It is only directed to the tradesman who objects to the gas undertaking using its resources for the development of a branch of the business which involves obligations beyond any which a local plumber is prepared to undertake. Some of these obligations are statutory, and the tradesman could not shoulder them if he would. With others he has no inclination to be burdened.

The object of a gas undertaking is to sell gas, and any reasonable means of achieving this object is legitimate, though, viewed from a narrow outlook, the means may be thought unreasonable. To put an extreme case, suppose that by providing free cookers and fires the sale of gas could be doubled, it could be shown, by the consequent reduction in price, that the consumer who never required a cooker or fire would save money, though the cooker and fire branch would show a heavy loss when assessed separately. It may happen that this loss would amount to 5d. per 1000 c.ft., or 1d. per therm, on all the gas sold; but if the resultant effect was to reduce the price of gas all round by this amount, a consumer taking gas for industrial purposes or lighting would have no cause for complaint. One often loses the broad view when delving into too much detail; and in this comparison, as in many others, the best basis of assessment is:

(*a*) Without the business, and with a profitable departmental balance-sheet.
(*b*) With the business, accompanied by a corresponding debit balance.

The general conditions of contract between a gas undertaking and its consumers with regard to hiring meters and stoves, and the fittings business generally, may be influenced by policy, equity, or by a combination of both. The broad term "policy" may or may not include the consideration of the collateral financial advantages referred to. In other words, policy may have no relation to finance, whether direct or collateral. It may have no relation to equity, but may be the result of continually taking the line of least resistance, even to the detriment of the uncomplaining majority, for the benefit of the minority who voice their grievances or thrust forward their point of view.

Referring to the Edinburgh case, the result has given universal satisfaction in the gas industry; but at the same time there were certain aspects put before the tribunal which contained at least a germ of truth and even wisdom. Admitted that certain of the points of criticism were exaggerated, and presented as the result of bias, yet, on some points, we have seen similar criticism from inside the industry. The "JOURNAL" rightly drew attention to the fact that the case did not invite a discussion on the principles

to be applied in fixing rents, but related to the legality of supplying meters and appliances rent free or at rents inadequate to meet the capital and other charges. At the same time, the question of adequacy involves the principle of basis of charge. In dealing with meter rents, the writer is strongly of opinion that the policy of making a charge is right and equitable. It may be that a board of directors or a committee have decided to abolish these rentals, at the request of a group of tradesmen or a ratepayers' association, or even a local authority; but in very few cases is the equity of the case put before those who complain or those who make the decision. The usual unconsidered argument in favour of abolition is the fact that the butcher adds nothing to the price of meat because he uses his scales. The answer is, of course, that he does, only that the provision and maintenance is so small as to be unnoticeable when translated into pence per pound of meat. Further, the butcher does not have to provide a pair of scales for each customer. If he did, the price of meat would certainly go up.

In the gas industry itself, meter hire is distinct from the charges for other appliances, since every customer must have a meter of a size in proportion to the demand which he can create. He need not necessarily consume in proportion; and this is one reason why a rent should be paid—*i.e.*, the gas company may provide something out of proportion to the value of the consumer. Further, the abolition of meter rents results in unfairly penalizing a good consumer. Taking "Field's Analysis," a fair return on ordinary meter rents for London, Suburban, and Provincial companies is about 2d. per 1000 c.ft. Consider two customers, one taking 5000 c.ft. and the other 50,000 c.ft. per annum. These are extreme, but not impossible, cases. If a 5-light meter is supplied to each at 5s. per annum rental, the following would be the position with gas at 4s. per 1000 c.ft.:

Large consumer—£10 for gas, *plus* 5s. for meter = £10 5s. per annum = 4s. 1·2d. per 1000 c.ft. in all.

Small consumer—£1 for gas, *plus* 5s. for meter = £1 5s. per annum = 5s. per 1000 c.ft. in all.

This may seem unfavourable to the small consumer, but this is an extreme case. He has the same installation as a consumer paying over eight times the total account to the company. Even at these figures the large consumer is a better one for the gas company, for meters wear out, even with little or no gas passing through them.

If meter rents were abolished, each would purchase gas at 4s. 2d. per 1000 c.ft. The small consumer would therefore be paying 10d. per annum for the interest, repair, and maintenance of a 5-light meter, compared with 8s. paid by the large consumer. In other words the best customer comes-off worst.

If meter rents are abolished, how is the stand-by consumer to be treated? Would he who might burn no gas at all expect to get a meter free of charge? If not, then, of course, there is a departure from the policy; and it might happen that a stand-by consumer would, in a given year, take more gas than a very small consumer who took gas solely. There are very few undertakings in a position to discriminate; and section 11 of the Act of 1871 compels an undertaking to give a supply. The supplier cannot refuse if the consumer is willing to guarantee a rental of 20 p.ct. (for two years) on the cost of the supply-pipe provided by the undertakers. Thus, if a supply-pipe costs £10, the consumer only need guarantee £2 per annum rental. Is such a consumer worth a meter free of rental?

A satisfactory method for any selling organization is to separate the costs of production and distribution from the services and ancillary branches. First ensure that each customer gets the goods at the same price that another would when purchasing the same quantity in the same conditions. An additional charge should be made for the services involved. Then the anomalous condition of affairs previously referred to would not arise. In the case chosen, the more valuable customer pays about 12½ p.ct. on the cost of the meter, compared with 1¼ p.ct. for the small consumer, in the event of the meter charges being included with those for the gas.

The meter rent is an equitable method of graduating the charge, and ensures that the most valued consumer shall have the best terms. There are arguments of a different nature, but equally strong, which can be put forward for the retention of stove rents, as well as coin meter installations. In the case of the latter, it must not be forgotten that it costs four or five times as much to collect £100 from coin-meter consumers as from ordinary consumers. An examination of any standard analysis of accounts in 1914 and one of twenty years earlier will prove that the cost of inspection had doubled in the period, due to the introduction of the appliances into the houses of consumers. This is an additional reason why the consumers enjoying the services should pay for them; and this is reflected in an industrial district by the large discounts given for gas used for purposes of industry. It is recognized that, apart from taking a large quantity, the factory entails no charge for stove maintenance, and little for collection. The factory is virtually a purchaser in bulk. Therefore, if a policy of free meter and stove rents is accompanied by a judicious scale of discounts, the principle of equitable treatment is recognized. If this scale of discounts extends to domestic consumers of modest pretensions, then perfect equity might be achieved; but discounts rarely extend so far as to meet the case discussed earlier.

It is not always realized that the receipts from meters, stoves, and coin-meter installations, expressed in pence per 1000 c.ft. or per therm, amount to a substantial amount. The following table is extracted from "Field's Analysis" for the year 1922; the figures being in pence per therm.

—	Meters.	Stoves.	Coin-Meter Fittings.	Total.
London companies . .	0·332	0·333	0·419	1·084
Suburban ,, . .	0·603	0·580	0·292	1·475
Provincial ,, . .	0·389	0·400	0·160	0·949
Corporations	0·021	0·082	0·006	0·109

It is seen that corporations are virtually selling gas at 0·9d. to 1·3d. per therm less than the nominal sum, by comparison with the companies, though, as previously mentioned, it does not follow that all classes of consumers are getting their respective share of the concession.

It would appear from the above figures that companies are unanimous in their opinion that these rents are fair and desirable, though the degree of unanimity is marked by a wide divergence.

It is interesting and instructive further to examine the actual receipts from these sources and to compare them with the corresponding expenditure. Without inside knowledge of the undertaking concerned, it would be difficult to estimate the increased expenditure due to inspection and collection; but the repairs and maintenance can be contrasted. The following table shows the comparison, and the surplus or deficit per therm.

Receipts and Repairs on Meters, Stoves, and Coin-Meter Fittings.

—	Receipts, £	Expenditure, £	£ Surplus or Deficit.	Surplus or Deficit, Pence per Therm.
Gas Light and Coke .	707,769	632,626	s. 75,343	0·114
Commercial . . .	88,419	96,826	d. 8,407	0·118
South Metropolitan .	360,117	464,684	d. 104,567	0 309
Brentford	111,340	82,967	s. 28,373	0·320
Croydon	39,290	34,028	s. 5,262	0·136
Hornsey	12,789	9,083	s. 3,706	0·270
Lea Bridge. . . .	29,113	17,069	s. 12,044	0·879
Richmond	7,465	3,713	s. 3,752	0·566
South Suburban . .	66,763	80,954	d. 14,191	0·246
Tottenham. . . .	97,519	50,318	s. 47,201	0·918
Wandsworth . . .	121,447	93,576	s. 27,871	0·500
Bath	18,264	11,388	s. 6,876	0·352
Brighton	54,364	65,112	d. 10,748	0·291
Bristol	57,771	56,730	s. 1,041	0·016
Derby	24,486	25,222	d. 736	0 028
Newcastle	78,103	64,277	s. 13,826	0·206
Plymouth	43,463	25,290	s. 18,173	0·720
Portsea	30,334	38,323	d. 7,989	0·230
Rochester	20,651	19,848	s. 803	0·056
*Sheffield	26,241	20,105	s. 6,136	0·074

* No coin-meters.

From this table it will be observed that in some instances the receipts are less than the cost of maintenance; so that, without taking into account the interest on capital, there is a direct loss. How far this is a true loss would be difficult to assess; but there is little doubt that good maintenance is repaid by more frequent and regular use of appliances. At the same time, it does not seem unreasonable to expect the receipts to equal the repairs and maintenance, for the additional costs of collection and inspection, and the interest on the capital invested in the appliances, would result in very serious deficits. Taking the London companies, the following table gives the deficit after calculating the interest at 5½ p.ct. on the estimated capital value.

—	Gas Light and Coke.	South Metropolitan.	Commercial.
	£	£	£
Receipts	707,769	360,117	88,419
Expenditure . . .	632,626	464,684	96,826
Surplus or deficit . .	surplus 75,343	deficit 104,567	deficit 8,407
Interest at 5½ p.ct. .	255,000	145,000	38,000
Total deficit . . .	179,657	249,567	46,407
Total deficit per therm	0·274d.	0·738d.	0·656d.

From this table it will be observed that, neglecting collection and administration, the deficits are seriously increased when the capital cost is included.

Policy and indirect advantages are probably sufficient to prevent the charges being increased to the theoretical amount necessary to provide the full debit charges; and it is not suggested that any increase is desirable. It would be an improvement, however, if the items of expenditure and receipts in the printed accounts referred to the same class of appliance.

It is frequently found that on the expenditure side the repairs of meters include both ordinary and slot meters, whereas the receipts are separated into ordinary meter rents and slot-meter rents, including stoves and fittings. The same applies to stoves. The respective costs can usually be isolated by a little additional dissection in the cost sheets.

Sufficient has been written to show that the matters referred to are important and interesting. In "The Administration and Finance of Gas Undertakings," the writer deals more fully with the matter of economic rents.

GASEOUS COMBUSTION AT HIGH PRESSURES: NEW EXPERIMENTS.

By WILLIAM A. BONE, D.Sc., Ph.D., F.R.S., Professor of Chemical Technology at the Imperial College of Science and Technology, London.

[A Friday Evening Discourse given before the Royal Institution of Great Britain on May 11—Sir Arthur Keith, M.D., LL.D., F.R.S., Secretary and Vice-President, in the chair.

(*Continued from p.* 365.)

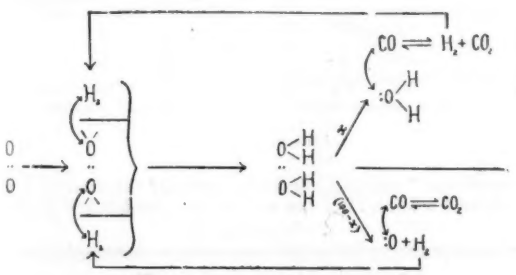
THE MECHANISM OF THE COMBUSTION OF CARBON MONOXIDE.

When the results of our carbon-monoxide-hydrogen experiments were published two years ago, I ventured to put forward tentatively, as a basis of discussion, the following view of the combustion of hydrogen and carbon monoxide; and as it seems to explain most of the known facts, perhaps I may be allowed to refer to it here. It involves the supposition that, whereas in certain cases of combustion (such as that of hydrogen) undissociated O_2 molecules can, and ordinarily do, interact directly with those of the combustible gas, yet in other cases (such as that of carbon monoxide) the dissociation of the oxygen involved is a necessary precedent to the actual oxidation; or, in other words, that oxygen in flames may function in two distinct ways—namely, (1) as undissociated O_2 and (2) as atomic : O.

To explain the peculiar influence of hydrogen or steam upon the combustion of carbon monoxide, I think it must be supposed that oxygen and carbon monoxide molecules are mutually inert in flames, and that before the carbon monoxide can be oxidized the O_2 molecules must be resolved either into O atoms or into "activated" steam. This precedent condition can be brought about by the presence of hydrogen (or, maybe, steam) in the mixture undergoing combustion. For, according to my view, an undissociated O_2 molecule on being heated in the flame has its "residual affinities" sufficiently stimulated to enable it to seize upon two hydrogen molecules, forming initially an unstable vibratory complex H_4O_2. Such a complex, being in an intensely vibratory condition, would instantly break down (1) partly into two molecules of steam, also in a vibratory—and therefore "activated"—condition, and (2) partly also into two : O atoms and two H_2 molecules, thus:

$$100\left(O\langle H \atop \| \atop O\langle H\right) \text{ would give rise to (simultaneously) } \begin{cases} (1)\ n \times 2 : O\langle H \\ (2)\ (100 - n)\ (2O : + 2H_2) \end{cases}$$

The ratio of $n/100 - n$ would obviously depend upon both temperature and environment. The higher the temperature and the less hydrogen in the environment, the less the magnitude of n. But in all conditions the hydrogen in a combustible mixture containing also carbon monoxide functions as a resolver of O_2 molecules simultaneously into (1) "activated" steam and (2) : O atoms. Thus it is suggested that the primary function of hydrogen as a promoter of the combustion of carbon monoxide is to resolve the O_2 molecules (inert towards carbon monoxide) into : O atoms and "activated" OH_2 (reactive towards carbon monoxide), itself being continuously regenerated in the process, as shown in the following scheme:



It may be observed that this view is similar to the one advanced forty years ago by Prof. H. B. Dixon to explain his discovery of the mutual inertness of dry carbon monoxide and oxygen in flames, but modified in one particular so as to make it more applicable to the further facts now known. He supposed that carbon monoxide was oxidized by OH_2 (but not by O_2) molecules in flames; the resulting hydrogen being immediately burnt to steam, which was thus continuously regenerated, as follows:

$$\left.\begin{array}{ll} (a)\ CO + OH_2 = CO_2 + H_2 \\ (b)\ 2H_2 + O_2 = 2H_2O \end{array}\right\}$$

If, however, only such interactions (and no others) occur, it is difficult to understand why the colour and spectrum of a flame of pure (moist) carbon monoxide are so unlike those of hydrogen burning in air. The characteristic spectrum of a carbon monoxide flame, which extends far into the ultra-violet, would surely seem to be due to the formation in it of some CO_2 molecules in a more highly vibratory state than would be likely to arise merely by interactions of CO and OH_2 molecules. The difficulty in question is obviated, and other facts are better explained, by supposing (as I do) that an unstable vibratory H_4O_2, complex primarily formed by the interaction of O_2 and H_2 molecules, decomposes in each of two ways, yielding : OH_2 and : O atoms, both of which are capable of oxidizing carbon monoxide.

It was at the conclusion of this part of our research that the accident happened which so tragically ended poor Haward's life, just as he was commencing another series of experiments designed to develop and follow-up the new issues raised. His untimely death cut short a career which had given promise of great distinction in scientific research, to which he was passionately devoted, and bereft us of a colleague whose rare experimental gifts and modest nature were the delight and praise of all who came in contact with him.

THE ENERGY-ABSORBING FUNCTION AND ACTIVATION OF NITROGEN IN THE COMBUSTION OF CARBON MONOXIDE.

From this point onwards the prime object of the research became the elucidation of the carbon monoxide question; and upon this issue all our efforts were concentrated. It next occurred to us to try the effects of progressively replacing the nitrogen of a normal carbon monoxide ($2CO + O_2 + 4N_2$) mixture by molecular equivalents of other gases—*e.g.*, oxygen, carbon monoxide, and argon. The first two of these gases are diatomic, and would have much the same densities and heat capacities as the nitrogen which they replaced; and though they might be expected to exert some "chemical mass" influence upon the combustion, yet in all other respects they would act as "diluents." In argon we had an absolutely inert monatomic gas of higher density, but smaller volumetric heat capacity, than nitrogen, and incapable of any internal vibrational energy. It would therefore presumably be incapable of exerting any effect upon the explosion other than that of merely sharing, by molecular collisions, in the increased kinetic energy acquired by the system as the result of the combustion.

It may be observed that, while the replacement of the nitrogen by the other gases would not affect in any way the total energy liberated on explosion, yet the experiments showed that it affected somewhat the proportion of the energy recorded by the gauge as pressure (temperature) at the instant of maximum pressure, and still more so the rapidity with which the pressure energy was developed.

In order not to embarrass you with more experimental detail than is necessary to illustrate the most salient features of our results, reference to a large number of intermediate experiments may be omitted, and attention focussed upon those in which the replacement of nitrogen by the other gases was complete.* The most important experimental results from this point of view are summarized in Table I., and illustrated by the set of pressure-time curves reproduced in fig. 8. And here it may be pointed out that the most essential data which must be established in such experiments are the following:

- P = the initial pressure in atmospheres at which each mixture is fired.
- P_m = the maximum pressure in atmospheres recorded in the explosion.
- t_m = the time in seconds required for the attainment of the maximum pressure after ignition.
- Σ = the thermal equivalent in K.C.U.'s of the energy liberated during the explosion.
- Also the percentage amount by which P falls during (say) 0·5 sec. after t_m.

TABLE I.

Mixture Exploded.	Σ	P_i	t_m	P_m	P_m/P_i	Per Cent. Fall in Pressure in 0·5 Sec. after t_m
$2CO + O_2 + 4N_2$.	10·2	50	0·190	409	8·18	11·6
$2CO + O_2 + 4O_2$.	10·0	50	0·005	460	9·20	33·33
$2CO + O_2 + 4CO$.	10·4	50	0·010	450	9·00	34·3
$2CO + O_2 + 4Ar$.	10·2	50	0·025	510	10·20	26·4

These and other similar results brought home to us very forcibly the conclusion that the nitrogen in the normal carbon-monoxide-air mixture had been exerting a specific influence on the whole course of events, which was manifested in a threefold effect upon the pressure curves—namely (1) a marked retardation of the rate of attainment of maximum pressure, (2) a lowering of the maximum pressure, and (3) a considerable retardation of the subsequent cooling. For whenever such nitrogen was wholly replaced by its molecular equivalent of any one of the other three gases, the development of pressure became nearly as rapid as in the explosion of a normal hydrogen-air mixture under like conditions. Moreover, comparative analyses of the pressure-time

* Full details of these have been published in the "Proc. Roy. Soc.," A. 103 (1923), pp. 205 to 232.

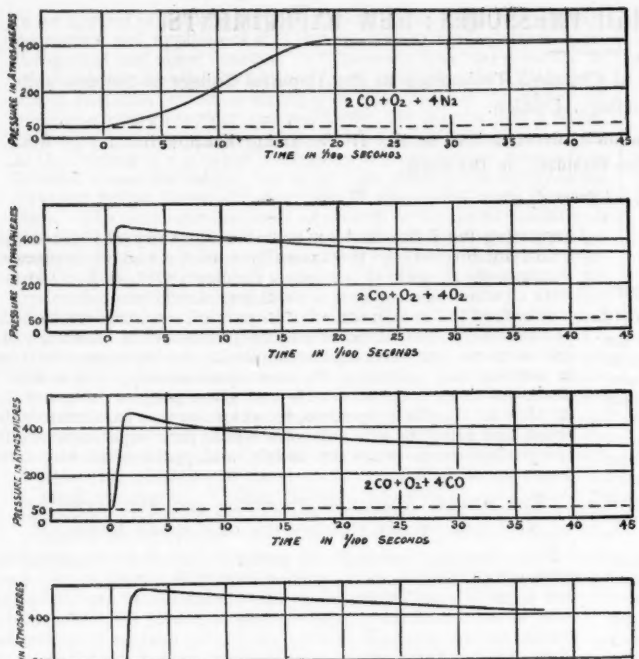


FIG. 8.

records obtained during the experiments in question have shown that, when nitrogen was present, much less kinetic (pressure) energy was absorbed up to the attainment of maximum pressure than was subsequently liberated during the cooling period. This remarkable circumstance shows that a considerable part of the radiation emitted by the burning carbon monoxide (which otherwise would have been absorbed by the walls of the explosion vessel) was intercepted by the nitrogen present. Part of the nitrogen so irradiated would then, in favourable circumstances, be oxidized to nitric oxide, thereby absorbing part of the kinetic energy developed by the explosion, and consequently reducing the maximum pressure attained. Finally, the radiant energy so absorbed by the nitrogen, *plus* part of the kinetic energy (if any) absorbed in forming nitric oxide during the combustion, was liberated as kinetic energy during the cooling period, so delaying the cooling. Thus it was manifest that, under our experimental conditions, nitrogen has the power of absorbing part of the radiant energy developed by the combustion of carbon monoxide, and of slowly giving it out again in a kinetic form during the subsequent cooling period. In other words, nitrogen is not inert, but acts as an "energy absorbing" spring in such explosions. Indeed, the results set forth in Table I. can hardly be explained on any other supposition.

Another important conclusion arising out of these experiments is that when nitrogen so absorbs radiant energy developed during a carbon-monoxide-air ($2CO + O_2 + 4N_2$) explosion under such conditions, it becomes chemically "activated," and capable of combining much more readily with oxygen than does nitrogen which has merely been raised to a correspondingly high temperature in a similar hydrogen-air ($2H_2 + O_2 + 4N_2$) explosion. Indeed, when the bomb was rinsed-out with distilled water after one of our hydrogen-air explosions at an initial pressure of 50 atmospheres, no more than a faint trace of nitric acid could be detected on applying the diphenylamine test to the washings; whereas in the case of the corresponding carbon-monoxide-air explosions, a similar test always showed a considerable formation of nitric acid.

It would seem as though the nitrogen molecule is able to absorb the particular quality of radiation emitted as the result of the interactions of CO and :O during a carbon-monoxide-air explosion, which is different from that emitted during a hydrogen-air explosion. In other words, it seems as though there is some constitutional correspondence between CO and N_2 molecules (whose densities are identical) whereby the vibrational energy (radiation) emitted when the one burns is such a quality as can be readily absorbed by the other; the two thus acting in resonance. The radiant energy so absorbed during the explosion presumably would not affect the maximum pressure attained, except in so far as the conditions permitted of any secondary oxidation of the "activated" nitrogen to nitric oxide during the actual combustion period; but radiant energy so absorbed would be liberated in a kinetic form during the subsequent cooling period, as the "activated" nitrogen slowly reverted to the ordinary form. Analyses of the pressure-time records obtained have confirmed this supposition.

Perhaps the following graphs (fig. 9) will enable you to appreciate the strength of the evidence obtained up to this point as to the activation of the nitrogen during a carbon-monoxide-air explosion at high pressure.

They show the rates of cooling (expressed as pressure fall in atmospheres per second) of the gaseous systems immediately after the attainment of maximum pressure, when each of the four mixtures $2CO + O_2 + 4N_2$, $2CO + O_2 + 4O_2$, $2CO + O_2 + 4Ar$, and $2H_2 + O_2 + 4N_2$, respectively, was exploded in the bomb at an initial pressure of 50 atmospheres. It will be seen that, except in the case of the carbon-monoxide-air mixture, the cooling was perfectly regular, and presented no abnormal features whatever. In the case of the $2CO + O_2 + 4N_2$ mixture, however, there was no cooling at all during the 0·1 sec. after the attainment of the maximum pressure; and it was not until the lapse of the 0·6 sec. thereafter that anything like a normal rate of cooling was established. Attention is specially drawn to the striking contrast between the perfect normality of the first 0·6 sec. of the cooling period in the case of the hydrogen-air ($2H_2 + O_2 + 4N_2$) mixture, and its complete abnormality in the case of the corresponding carbon-monoxide-air mixture. This circumstance, combined with the perfect normality of the cooling in the case of the $2CO + O_2 + 4Ar$ mixture, can hardly be explained except on the assumption that the nitrogen functions differently in a hydrogen-air explosion, where it acts as an inert diluent only, from what it does in a carbon-monoxide-air explosion, where, in addition to its ordinary diluent action, it has a peculiar "energy absorbing" effect, whereby it becomes chemically "activated." On such an assumption the meaning of the $2CO + O_2 + 4N_2$ cooling curve is that the radiant energy which had been absorbed by the N_2 molecule during the previous combustion period was being slowly evolved in a kinetic form far into the subsequent cooling period,

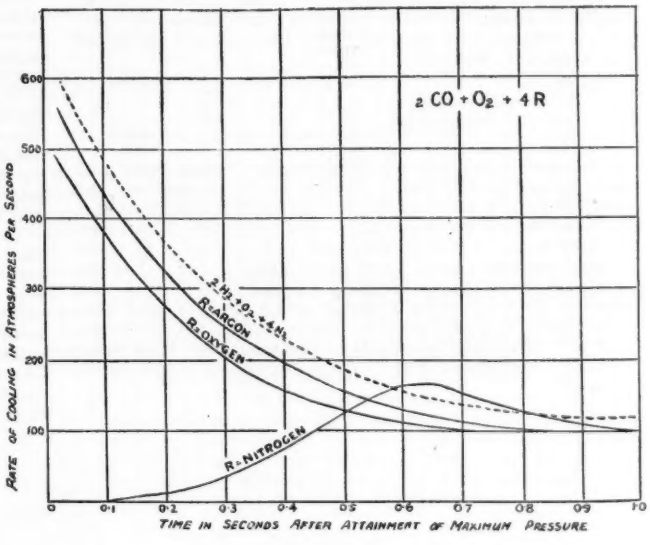


FIG. 9.

the "activated" nitrogen not having entirely reverted to normal until at least 0·6 sec. after the end of the combustion period.

(To be continued.)

The Paris Liquid Fuel Congress.

Our anxiety to receive some news of the International Liquid Fuel Congress and Exhibition held in Paris last October was almost forgotten when, a short time ago, we were fortunate enough to receive a copy of the report. This has been published in the form of a special number, for May, of "Chimie et Industrie," the official organ of the Société de Chimie Industrielle; and certainly the amount of matter included in the tome, as well as the diversity of the subjects covered by the contributions, constitutes ample excuse for the long delay in its appearance. As the publishers point out in their covering letter, the volume contains over 900 large quarto pages, and weighs some 5 lbs. The conference was organized into six sections, dealing with the following branches of the fuel-oil industry: Petrol; shale; lignite and peat; tar and benzole; alcohol; and vegetable oils. Prof. Sabatier was chosen as President of the Congress; and our friend M. Mallet, Past-President of the Société Technique de l'Industrie du Gaz en France, was appointed to the chair of the Tar and Benzole Section, which most nearly concerned the gas industry. Of more than a hundred papers in all presented at the meeting, only twelve were submitted to M. Mallet's section.

BOARD OF TRADE GAS UNDERTAKINGS RETURN FOR 1922.

Part I.—Manufacture and Supply of Gas.

READERS will remember that in January and February last there appeared the first issue in the new form of the Board of Trade Return relating to Authorized Gas Undertakings in Great Britain—covering the year 1921. Now we have before us—only six months later—the first part of the return for the year 1922. It may be repeated that, as was previously the case, the return is divided into two parts; but instead of the division being between the undertakings belonging to companies and those in the hands of local authorities, Part I. contains particulars relating to the manufacture and supply of gas by both classes of undertakings, while Part II. is concerned with financial matters. With few exceptions, the information now given has reference to the calendar year 1922 in the case of undertakings in England and Wales, and to the financial year of the undertaking ended previous to Dec. 31, 1922, for works in Scotland.

The price of Part. I. is 5s. net (post free 5s. 1d.); and it is published by H.M. Stationery Office at Imperial House, Kingsway, London, W.C. 2, and branches.

Part I. of the return relating to 1921 dealt with 797 undertakings; but now three of the undertakings shown in that return—Abersychan, Great Marlow, and Southborough—are omitted, as they have been absorbed. Two new undertakings—those of the Beaumaris and the Eye Corporations—are added, so that on the present occasion the return deals with 796 undertakings. There have, however, been other changes. The Staffordshire Potteries undertaking of the British Gas Light Company, Ltd., now appears as one of those of the Stoke-on-Trent Corporation. The Briton Ferry undertaking now belongs to the Neath Corporation; and that of the Calne Gas and Coke Company, Ltd., to the Calne Corporation. The figures referring to the Ilford undertaking are for a half-year only, in consequence of absorption by the Gas Light and Coke Company. Oakengates was amalgamated with Wellington (Salop.) on the same date; but it was run separately until the end of the year. The St. Anne's-on-the-Sea Gas Company figure is for nine months prior to absorption by the Lytham St. Anne's Corporation. The Stretford undertaking, which for the greater part of 1922 was in the hands of the Manchester Corporation, is shown as belonging to the Stretford and District Gas Board. In Scotland, the undertaking of the Bothwell and Uddingston Gas Company, Ltd., has been taken over by the Lanark County Council. In England and Wales, 478 of the undertakings are shown as belonging to companies, and 251 to local authorities; the figures for Scotland being 4 to companies and 63 to local authorities.

DECLARATIONS OF CALORIFIC VALUE.

Again the first column of figures is devoted to the declared and the average calorific values supplied (as officially ascertained); but in some cases where the declared calorific value is indicated, the average supplied cannot be stated, because a prescription had not been made by the Gas Referees before Oct. 1, 1922, no gas examiner had been appointed, or no test had been made. When noticing the preceding return in the "JOURNAL" for Jan. 31 last (p. 259) a list was given of the 184 undertakings which had made declarations of calorific value on or before Dec. 31, 1921. To these were added in 1922 the following undertakings, with their declarations in B.Th.U.:

Aberdare and Aberaman, 500
Aberystwyth, 425
Alnwick, 500
Altrincham, 450
Annfield Plain, 500
Arundel, 500
Ascot, 475
Banbury, 450
Barnet, 475
Barnsley, 500
Barnstaple, 500
Basingstoke, 500
Bath, 480
Bexhill, 480
Bideford, 500
Bilston, 450
Bognor, 475
Bordon, 500
Brading Harbour, 450
Brecon, 450
Brentwood, 450
Bristol, 480
Brixham, 500
Bromsgrove, 450
Brynmawr and Blaina, 450
Bury St. Edmunds, 500
Busby, 500
Castleford and Whitwood, 500
Chapel Whaley, 475
Chasetown, 500
Chelmsford, 450
Chepstow, 470
Chester-le-Street, 500
Chippenham, 510
Cirencester, 450
Clevedon, 450
Conisbrough, 500
Cranleigh, 500
Crediton, 500
Crossgates and Halton, 550
Crowborough, 475
Denton, 500
Dorchester, 450
Dorking, 425
Dover, 450
Dowlais, 500
Draycott, 500
Drighlington, 500
Durham, 500
East Dereham, 450
East Grinstead, 440
Eckington and Mosborough, 480
Edenbridge, 500
Elstree and Boreham Wood, 460
Ely, 500
Emsworth, 475
Farnham, 460
Farnworth and Kearsley, 480
Ferndale, 450
Fleetwood, 460
Freshwater, 500
Gowerton, 450
Gravesend and Milton, 425
Great Wigston, 450
Halesowen, 440
Harrogate, 460
Haslingden, 450
Hayward's Heath, 425
Heathfield and Waldron, 490
Herne Bay, 475
Hitchin, 500
Hoddesdon, 480
Holywell (British Gas Light), 510
Horley, 475
Hyde, 450
Ilkley, 560
Kenilworth, 400
Keswick, 500
Kildwick, 500
Knottingley, 425
Knutsford, 450
Langley Mill and Heanor, 440
Launceston, 500
Leamington Priors, 480
Leicester, 450
Lewes, 500
Leyland, 470
Lichfield, 450
Littleborough, 500
Llantrisant, 500
Luton, 490
Lymington, 450
Macclesfield, 420
Manningtree and Mistley, 550
Matlock, 500
Melksham, 500
Middlewich, 475
Mid-Kent, 450
Milnrow, 500
Milton-Regis, 460
Mirfield, 500
Mynyddislwyn, 425
Neath, 425
New Hedon, 500
Newmarket, 550
Newport (Isle of Wight), 500
Newport Pagnell, 500
Northfleet and Greenhithe, 450
Oakengates and St. George's, 500
Otley, 500
Paignton, 500
Peterborough, 500
Pontypool, 450
Portishead, 550
Pudsey, 500
Raunds, 470
Redcar, 460
Redditch, 475
Ripley, 450
Rochdale, 475
Rossendale, 475
Rowley Regis and Blackheath, 430
Rugeley, 475
St. Anne's-on-the-Sea, 500
St. Austell, 450
St. Helens, 475
St. Neots, 475
Sandbach, 500
Seaham, 530
Sheppy, 460
Shotley Bridge and Consett, 500
Sittingbourne, 475
Southbank and Normanby, 400
South Oxfordshire, 320
Staveley, 480
Stocksbridge, 500
Stoke-on-Trent:
  Burslem, 470
  Fenton, 470
  Longton, 470
  Potteries, 470
  Stoke-upon-Trent, 470
Stourport, 450
Swaffham, 500
Swanage, 450
Swindon, 400
Taunton, 460
Tavistock, 500
Tonbridge, 400
Trowbridge (British Gas Light), 500
Truro, 450
Twyford (Berks.), 475
Tynemouth, 470
United District, 450
Uttoxeter, 500
Wakefield, 500
Warminster, 500
Wellington (Somerset), 500
Westhoughton, 500
Weymouth, 460
Whitchurch (Salop), 500
Wimborne Minster, 500
Windsor, 450
Witney, 450
Worksop, 470
Yeovil, 450

With regard to the list given for 1921, it is pointed out that during 1922 eleven of the undertakings there set out made an alteration in their declared calorific value—in every case, to a higher figure. The companies concerned, and the new and original calorific values are:

Brighton and Hove General Gas Company—now 500 B.Th.U.; previously 470 B.Th.U.
Dinnington and District Gas Company—now 475 B.Th.U.; previously 450 B.Th.U.
Gas Light and Coke Company—now 500 B.Th.U.; previously 475 B.Th.U.
Plymouth and Stonehouse Gas Light and Coke Company—now 450 B.Th.U.; previously 425 B.Th.U.
Runcorn Gas Company—now 500 B.Th.U.; previously 480 B.Th.U.
Sheffield Gas Company—now 500 B.Th.U.; previously 480 B.Th.U.
Southgate and District Gas Company—now 475 B.Th.U.; previously 450 B.Th.U.
South Metropolitan Gas Company—now 560 B.Th.U.; previously 550 B.Th.U.
Tottenham District Light, Heat, and Power Company—now 500 B.Th.U.; previously 450 B.Th.U.
Walker and Wallsend Union Gas Company—now 525 B.Th.U.; previously 500 B.Th.U.
Coatbridge Gas Company—now 475 B.Th.U.; previously 450 B.Th.U.

WATER GAS SUPPLIED.

The next column of the return sets out the proportion of water gas supplied by various undertakings; the maximum and average figures being given as usual. Glancing down the table, the following cases (with their percentages) are noted in which the maximum proportion of water gas supplied in the gas reached 25 p.ct.

Abercarn, max., 25; av., 25.
Abertillery, max., 30; av., 15.
Aldershot, max., 32; av., 2·6.
Ashford, max., 39·2; av., 9·4.
Aylesbury, max., 25; av., 10.
Banbury, max., 27; av., 16·2.
Barnet, max., 25; av., 14.
Barry, max., 40; av., 15.
Bath, max., 48; av., 27.
Batley, max., 25; av., 16.
Bexhill, max., 39·1; av., 25.
Bilston, max., 30; av., 5.
Birkenhead, max., 63·3; av., 39·4.
Birmingham, max., 28·2; av., 19·4.
Bishop's Stortford, max., 56·9; av., 34·7.
Blackpool, max., 29; av., 15·6.
Blaenavon, max., 35; av., 30·6.
Bournemouth, max., 49; av., 40.
Brentford, max., 50; av., 41.
Brentwood, max., 30; av., 20.
Bridlington, max., 47·1; av., 29·1.
Brierley Hill, max., 62·5; av., 42.
Brighton and Hove, max., 48·7; av., 39·9.
Bristol, max., 42·4; av., 25·6.
Budleigh Salterton, max., 32; av., 20.
Burnley, max., 40; av., 30·4.
Cambridge, max., 30; av., 26.
Cardiff, max., 32; av., 20·5.
Carlisle, max., 51·8; av., 39·6.
Carnarvon, max., 45; av., 33.
Chelmsford, max., 29; av., 14·9
Chesterfield, max., 40; av., 18·3.
Chichester, max., 52; av., 21·5.
Chorley, max., 35·4; av., 7·3.
Clacton, max., 34·5; av., 21·6.
Cleator Moor, max., 43·3; av., 33·6.

Cleveland, max., 30; av., 25.
Colchester, max., 38·5; av., 18·2.
Colne, max., 35; av., 27.
Colwyn Bay, max., 35; av., 27.
Commercial Gas Company, max., 33·3; av., 18·6.
Conway, max., 40; av., 35.
Coventry, max., 40·1; av., 27·8.
Crowborough, max., 52·1; av., 41·2.
Croydon, max., 41·3; av., 33·1.
Derby, max., 33·8; av., 16·3.
Doncaster, max., 35·8; av., 18·7.
Dorchester, max., 39·5; av., 24·3.
Dorking, max., 25; av., 9·6.
Dover, max., 40; av., 25.
Draycott, max., 30; av., 17·5.
Dudley, max., 49·6; av., 36·9.
Dursley, max., 50; av., 33·3.
Eastbourne, max., 35; av., 22.
East Grinstead, max., 26·2; av., 18·8.
East Hull, max., 37·9; av., 23·6.
Eckington and Mosborough, max., 35; av., 28·4.
Falmouth, max., 26; av., 16.
Felixstowe, max, 38; av., 16·4.
Fleetwood, max., 32·6; av., 21 9.
Gas Light and Coke Co.. max., 37; av., 31.
Gloucester, max., 41·5; av., 29·4.
Gorleston and Southtown, max., 35; av., 33.
Gosport, max., 64·5; av., 44·1.
Gravesend and Milton, max., 37; av., 24·8.
Grays and Tilbury, max., 41·7; av., 24·3.
Guildford, max., 25; av., 20.
Hampton Court, max., 43·7; av., 35.
Harpenden, max., 50; av., 37.
Harrow and Stanmore, max., 54; av., 51·5.
Hartlepool, max., 35·5; av., 19·3.
Harwich, max., 25; av., 25.
Haslemere, max., 33; av., 30.
Haslingden Union, max., 25; av., 20.
Hastings and St. Leonards, max., 40·6; av., 25·6.
Havant, max., 25; av., 20.
Hindley, max., 40·9; av., 35.
Honley, max., 50; av., 25.
Horley, max., 33·4; av., 24·7.
Hornsey, max., 60; av., 42.
Horsham, max., 27; av., 15.
Hull (British Gas Light), max., 51·5; av., 31·6.
Hull Corporation, max., 51·5; av., 31·6.
Ilford, max., 48; av., 33.
Ipswich, max., 35; av., 25·9.
Irthlingborough, max., 42; av., 39.
Kidderminster, max., 30; av., 21.
Kingston-upon-Thames, max., 45; av., 29.
Kirkby-in-Ashfield, max., 30; av., 20.
Knutsford, max., 70; av., 30.
Langley Mill and Heanor, max., 25; av., 10.
Lea Bridge, max., 45·5; av., 38·5.
Leamington, max., 45; av., 20.
Leeds, max., 33·6; av., 17·6.
Leigh, max., 25; av., 20.
Leighton Buzzard, max., 28; av., 14·4.
Lewes, max., 33; av., 17.
Lincoln, max., 33·3; av., 16·1.
Liverpool, max., 45·8; av., 37.
Llandudno, max., 30: av., 25.
Llanelly, max., 70; av., 62.
Llynvi Valley, max., 35; av., 29.
Loughborough, max., 25; av., 20·6.
Lymm, max., 30; av., 10.
Macclesfield, max., 44·8; av., 6·4.
Maidenhead, max., 60; av., 54.
Maidstone, max., 34; av., 26.
Malton, max., 30; av., 10·6.
Manchester, max., 28·8; av., 16·1.
Mansfield, max., 34; av., 24.
Marlborough, max., 30; av., 14.
Marple, max., 25; av., 25
Merthyr Tydfil, max., 30; av., 9·8.
Middlesbrough, max., 32·2; av., 6·4.
Mid-Kent, max., 34·9; av., 24·9.
Morley, max., 25; av., 10.
Newark, max., 70; av., 50.
Newbury, max., 40; av., 27·4.
Newport (Mon.), max., 48·8; av., 39.
Normanton, max., 31; av., 21.
North Middlesex, max., 71·4; av., 62·4.
Norwich (British Gas Light), max., 41·6; av., 23·9.
Oldbury, max., 57·1; av., 18·8.
Ormskirk, max., 25; av., 14·3.
Oxford, max., 27·5; av., 26.
Pembroke, max., 25; av., 1·6.
Peterborough, max., 30·4; av., 23·2.
Pinner, max., 25; av., 20.
Plymouth Corporation, max., 68·1; av., 52·4.
Plymouth and Stonehouse Gas Company, max., 60·8; av., 49·6.
Pontypridd, max., 34; av., 27.
Portsea Island, max., 39·4; av., 32.
Port Talbot, max., 25; av., 12.
Prescot, max., 25; av., 22·4.
Preston, max., 38; av., 21.
Reading, max., 53·4; av., 37·7.
Redhill, max., 43·9; av., 18·6.
Rhyl, max., 34; av., 26.
Richmond, max., 62; av., 24·5.
Rickmansworth, max., 27·5; av., 19·4.
Rochdale, max., 25·5; av., 20·8.
Rochester and Chatham, max., 43·1; av., 23·7.
Romford, max., 51; av., 34.
Rossendale, max., 25; av., 18.
Rugby, max., 55; av., 43·9.
Rushden and Higham Ferrers, max., 32·8; av., 19·5.
St. Albans, max., 50; av., 28·1.
Salisbury, max., 97; av., 1·6.
Sandown, max., 35; av., 20.
Scarborough, max., 66; av., 45.
Seaham, max., 33; av., 18·2.
Selby, max., 33; av., 20.
Sevenoaks, max., 50; av. 30.
Sheppy, max., 35·1; av., 31·7.
Sheringham, max., 25; av., 14.
Silsden, max., 33; av., 22.
Smethwick, max., 28·2; av., 9·6.
Southampton, max., 55·5; av., 40·4.
Southend, max., 51·8; av., 44·2.
Southgate, max., 65·4; av., 51·1.
South Shields, max., 38·3; av., 14·7.
South Suburban Gas Company, max., 31·4; av., 24·4.
Stafford, max., 25; av., 25.
Stockport, max., 52; av., 12.
Stockton-on-Tees, max., 35·1; av., 10·4.
Stoke-on-Trent Corporation—
Longton, max., 44; av., 11·4.
Potteries, max., 39·3; av., 22·5.
Stretford, max., 28·9; av., 18·7.
Sunderland, max., 25; av., 19·7.
Swanage, max., 30; av., 15.
Swansea, max., 50; av., 39·8.
Swindon, max., 45; av., 16·3.
Taunton, max., 28; av., 11.
Teignmouth, max., 33·3; av., 25.
Tendring Hundred (Walton-on-Naze), max., 33; av., 24.
Thirsk, max., 33·3; av., 33·3.
Tonbridge, max., 56·5; av., 55·4.
Torquay, max., 60·3; av., 38·2.
Tottenham, max., 54; av., 25·6.
Trowbridge (British Gas Light), max., 31·2; av., 19·9.
Tunbridge Wells, max., 60; av., 46·7.
Tynemouth, max., 25; av., 14·5.
Wakefield, max., 29·6; av., 22·9.
Walsall, max., 43; av., 15·4.
Waltham and Cheshunt, max., 40; av., 32.
Walton-on-Thames and Weybridge, max., 35; av., 30·9.
Warwick, max., 46; av., 18·9.
Watford, max., 27·5; av., 19·4.
Wellingborough, max., 60; av., 46·6.
Wells, max., 33·3; av., 22·9.
West Bromwich, max., 26·2; av., 7·2.
Westgate and Birchington, max., 35; av., 24·9.
Weston-super-Mare, max., 54·9; av., 29·1.
West Staffordshire, max., 25; av., 25.
Weymouth, max., 35; av., 13.
Wigan, max., 28; av., 12.
Winchester, max., 50; av., 45.
Woking, max., 40; av., 16·8.
Wokingham, max., 30; av., 25.
Wolverhampton, max., 46·7; av., 39·4.
Woolton, max., 27; av., 16·4.
Yeadon and Guiseley, max., 30; av., 27.
York, max., 55·4; av., 11·7.
Aberdeen, max., 26·6; av., 15.
Airdrie, max., 50; av., 40.
Burntisland, max., 30; av., 30.
Edinburgh, max., 50·2; av., 26.
Greenock, max., 29·7; av., 4·6.
Johnstone, max., 30; av., 25.
Kilmarnock, max., 35; av., 19·3.
Kirkintilloch, max., 32; av., 5·7.
Stirling, max., 46; av., 42.
Tayport, max., 30; av., 28.

Cubic Feet and Therms.

The headings to the columns of figures are precisely the same as on the last occasion; and again the quantities of gas made and sold are shown both in cubic feet and therms, if the undertaking was authorized during any part of the year to charge for heat units supplied. The number of therms made is based on the average calorific value supplied as officially ascertained; but in cases where no test has been made, the figure shown is based either on the average calorific value supplied as stated by the undertaking, or on the declared calorific value. The number of therms sold is in all cases based on the declared calorific value.

Other Gas.

The first of the tables now set out separately in the return contains the quantity of "other gas" included in the total gas made, as shown in the main body of the return, by 41 undertakings. Most frequently this "other gas" is specified as being Tully gas and carburetted hydrogen. The Hightown Gas and Electricity Company sent out 236,000 c.ft. of petrol air gas, and the Montgomery Corporation 750,000 c.ft.; while 62,000 c.ft. of acetylene gas were supplied by the Portsoy Corporation. The make of Mond gas by the South Staffordshire Mond Gas Company is recorded as 2,522,833,000 c.ft.

Gas in Bulk.

The second table indicates the quantities of gas sold in bulk to, or bought in bulk from, other authorized undertakings. These figures are included only once in the main body of the return—namely, as made by the selling undertaking, and sold to consumers by the purchasing undertaking. The total quantity of gas thus bought in bulk was 401,616,000 c.ft. There were in 1922, 31 undertakings which sold gas in bulk to others, and 32 which similarly purchased it. The largest sellers were the Hull (British Gas Light Company, Ltd.) 65,861,000 c.ft., the Rhymney and Aber Gas Company 47,481,000 c.ft., the Watford Gas and Coke Company 73,654,000 c.ft., the Windsor Royal Gas Light Company 23,503,000 c.ft., and the Bothwell and Uddingston undertaking (Lanark County Council) 30,507,000 c.ft. The biggest purchasers were the Bedwellty Urban District Council 47,482,000 c.ft., the Hull Corporation 65,861,000 c.ft., the Mynyddislwyn Urban District Council 24,297,000 c.ft., the Rickmansworth Urban District Council 48,150,000 c.ft., the Uxbridge, Wycombe, and District Gas Company 59,641,000 c.ft., and the Bellshill undertaking (Lanark County Council) 30,507,000 c.ft.

Coke-Oven Gas Supplies.

In the year under review, there was a large increase in the total quantity of gas bought from owners of coke-ovens by authorized gas undertakings (and appearing in the return as sold to consumers by those undertakings). The following were the purchasing undertakings:

Purchasing Undertaking.	Quantity of Gas Involved.
	C.Ft.
Chesterfield Corporation	35,790 000
Dinnington and District Gas Company	32,452,000
Eckington and Mosborough Gas Company, Ltd.	643,000
Kidsgrove Gas Light Company	15,758,000
Leeds Corporation	243,192,000
Little Hulton Urban District Council	21,751,000
Middlesbrough Corporation	686,389,000
Ossett Corporation	151,112,000
Pontypridd Urban District Council	132,837,000
Port Talbot Corporation	62,682,000
Rhymney and Aber Gas Company	289,249,000
Rotherham Corporation	202,592,000
Sheffield Gas Company	1,548,764,000
Stocksbridge Gas Company	30,542,000
Swinton and Mexborough Gas Board	67,539,000
Wath, Bolton, and Thurnscoe Gas Board	114,386,000
Total	3,635,678,000

This total compares with a figure of 1,325,027,000 c.ft. of coke-oven gas purchased in the same way in 1921.

Materials other than Coal, Coke, and Oil.

As usual, in the returns made by some undertakings information was given as to materials other than coal, coke, and oil used in the manufacture of gas. The particulars so furnished are set out in the fourth table; but in all cases the quantities involved are small. Among them the Hightown Gas and Electricity Company used 643 gallons of hydrocarbon residue and 893 gallons of petrol, the Leeds Corporation 34 tons of anthracite, the Montgomery Corporation 500 gallons of petrol and 200 gallons of hydrocarbon, the Newquay (Cornwall) Gas Company 2000 gallons of tar, the Elgin Corporation 180 tons of wood, and the Portsoy Corporation 9 tons of calcium carbide.

The Comparative Table.

The comparative table here reproduced gives the totals of the whole of the authorized undertakings included in the return for the years 1920, 1921, and 1922. The separate figures for England and Wales and Scotland for the years 1921 and 1922 are:

1922.

England and Wales.—Coal carbonized, 14,352,910 tons; coke for water gas, 1,013,680 tons; oil used, 45,991,553 gallons; coal gas made, 183,204,823,000 c.ft.; water gas, 42,165,211,000 c.ft.; total gas made, 231,511,682,000 c.ft.; sold to prepayment consumers, 73,066,084,000 c.ft.; to ordinary and power consumers, &c., 133,513,585,000 c.ft.; for public lamps, 7,406,723,000 c.ft.; total quantity sold, 213,986,392,000 c.ft.; coke and breeze made,

COMPARATIVE TABLE.

Year.	Number of Authorized Undertakings Included in Return.	Materials Used in Manufacture of Gas.			Quantity of Gas.										Quantity of Residuals Made.			Number of Consumers.		Length of Mains.
					Made.				Sold.											
		Coal Carbonized.	Coke for Water Gas.	Oil.	Coal Gas.	Water Gas.	Total Made.		To Prepayment Consumers.	To Ordinary and Power Consumers, &c.	For Public Lamps.	Total Sold.			Coke and Breeze.	Tar.	Sulphate of Ammonia.	Prepayment.	Ordinary.	
		Tons.	Tons.	Gallons.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft	Therms.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	1000 C.Ft.	Therms.		Tons.	Gallons.	Tons.			Miles.
1920. . .	798	17,566,316	‡	‡	214,703,118	36,932,530	*256,977,744	‡	77,911,168	150,562,911	6,928,745	235,402,824	‡		‡	‡	‡	4,030,647	3,417,685	38,847
1921. . .	797	15,775,696	1,254,122	51,731,492	194,518,147	49,894,716	*249,019,732	§	80,285,658	141,768,032	7,023,422	229,077,112	§		10,404,702	160,376,472	115,979	4,071,220	3,488,090	39,547½
1922. . .	796	15,907,095	1,057,909	46,145,160	201,963,546	43,946,129	*252,070,321	§	78,224,063	146,174,788	8,203,938	232,602,789	§		10,475,155	169,770,531	113,373	4,137,009	3,535,137	40,231½

* Including "Other gas," in 1920, 5,342,096,000 c.ft., 1921, 4,606,869,000 c.ft., and 1922, 6,160,646,000 c.ft. § The number of therms made and sold by all undertakings cannot be given. ‡ Information not available.

9 575,219 tons; tar, 151,092,034 gallons; sulphate of ammonia, 98,897 tons; number of prepayment consumers, 3,855,021; ordinary consumers, 3,047,444; total number of consumers, 6,902,465; length of gas-mains, 36,917½ miles.

Scotland.—Coal carbonized, 1,554,185 tons; coke for water gas, 44,229 tons; oil used, 153,637 gallons; coal gas made, 18,747,174,000 c.ft.; water gas, 1,780,918,000 c.ft.; total gas made, 20,558,639,000 c.ft.; sold to prepayment consumers, 5,157,979,000 c.ft.; to ordinary and power consumers, &c., 12,661,203,000 c.ft.; for public lamps, 797,215,000 c.ft.; total quantity sold, 18,616,397,000 c.ft.; coke and breeze made, 899,936 tons; tar, 18,678 497 gallons; sulphate of ammonia, 14,476 tons; number of prepayment consumers, 281,988; ordinary consumers. 487,693; total number of consumers, 769,681; length of gas-mains, 3314 miles.

1921.

England and Wales.—Coal carbonized, 14,168,094 tons; coke for water gas, 1,207,004 tons; oil used, 51,573·577 gallons; coal gas made, 175,857,966,000 c.ft.; water gas, 48,130,149,000 c.ft.; total, 228.524,923,000 c.ft.; sold to prepayment consumers, 75.084,478,000 c.ft.; to ordinary and power consumers, &c., 128,853,161,000 c.ft.; for public lamps, 6,203.981,000 c.ft.; total sold, 210,141,620,000 c.ft.; coke and breeze, 9,434,851 tons; tar, 143,130,812 gallons; sulphate of ammonia, 101,738 tons; number of prepayment consumers, 3,790,608; ordinary consumers, 2,999,255; total number of consumers, 6,789,863; length of gas-mains, 36 260¼ miles.

Scotland.—Coal carbonized, 1,607,602 tons; coke for water gas, 47,118 tons; oil used, 157.915 gallons; coal gas made, 18,660,181,000 c.ft.; water gas, 1,764.567,000 c.ft.; total made, 20,494,809,000 c.ft.; sold to prepayment consumers, 5.201,180,000 c.ft.; to ordinary and power consumers, &c., 12,914,871,000 c.ft.; for public lamps, 819,441,000 c.ft.; total sold, 18,935,492,000 c.ft.; coke and breeze, 969,851 tons; tar, 17,245,660 gallons; sulphate of ammonia, 14,241 tons; number of prepayment consumers, 280,612; ordinary consumers, 488,835; total number of consumers, 769,447; length of gas-mains, 3287¼ miles.

LIQUID PURIFICATION RESULTS.

The Koppers or "Seaboard" Process.

In the "JOURNAL" for Nov. 29 last (p. 566) there was reproduced a paper read by Mr. F. W. Seymour, at the annual meeting of the Michigan Gas Association, on "Liquid Purification at Battle Creek." The system of which details and working results were there given is the Koppers or "Seaboard" liquid purification process, the British rights for which have been acquired by Messrs. Woodall, Duckham, and Jones (1920), Ltd. It has as its principle of operation the use of a dilute aqueous solution of sodium carbonate, or soda ash, to remove the sulphur compounds from gas by scrubbing contact with it. After such scrubbing, the foul solution is revived by the very simple means of blowing air through it, and with no further treatment is again used for sulphur absorption. To provide the proper scrubbing conditions, the soda solution is circulated through two cylindrical towers. The solution is pumped to the top of the tower and distributed over the cross section of the shell by a set of sprays. The tower is of such height as to give ample time for scrubbing contact between the descending streams of liquor and the ascending gas in one case, and ascending air in the other. The wetted surface is made-up of trays, spiral tiles, or coke.

At a meeting earlier this year of the American Society of Gas Lighting, Mr. C. J. Ramsburg read a paper in which he reviewed the progress made by liquid purification as developed by the Koppers Company. There were in April last seven plants in operation, and twelve in course of construction; and from information regarding those in operation, he was able to say that the process was a success in every particular. The Koppers Company had not, the author said, so far had an opportunity of trying the process on a large scale with carburetted water gas; but during the winter months, for a long period, the Battle Creek Gas Company ran mixed gas through their plant; and there was strong evidence that on carburetted water gas, not only would the efficiency be satisfactory, but the consumption of soda would be small and the cost of 90 p.ct. purification a very low figure. At Battle Creek there was a considerable quantity of tar taken out of the gas by the soda solution when water gas was being purified; but on account of the great difference in specific gravity, there was no tendency to emulsify, nor was the efficiency affected unfavourably.

It appears that hard carefully screened coke is being utilized as packing in most of the plants. One-half to one inch coke can be supplied at a cost of not over 40 c. per cubic foot. This coke offers a surface of over 50 sq.ft. per cubic foot, but entails a back pressure somewhat higher than that of spiral tiles or wooden hurdles. It is, said Mr. Ramsburg, usually desirable to supply a liquid purification plant at a low initial cost; and it is the intention of the Koppers Company fully to try-out the cheaper types of packing, at the same time making the tower large enough for the use of any one of several forms. In order to reduce the back pressure in towers filled with coke, and so maintain a low operating cost for power, it is necessary to increase the cross-sectional area of the towers; and with this increase arise problems which illustrate how complex are the factors involved in the design of liquid purification plants. Efficient operation is best maintained by promoting a vigorous stirring action, which will constantly bring fresh solution from the centre to the interacting surface. This stirring action is markedly influenced by the velocity of the gas; and thus, with increase in cross section and decrease in gas velocity, there results a change in capacity. At the same time, another and more difficult problem arises. With the increase in cross section, it becomes necessary to distribute the same amount of liquid evenly over a larger area. These matters are being studied by the Koppers Company.

Marked success has been attained in installations where it has been possible to utilize existing tall towers of narrow cross section —such as old benzole towers—since these give a relatively high gas velocity and excellent re-distribution of liquid. In new plants, which should preferably follow these lines, the construction of such towers is limited by the high first costs involved. Hurdle-

packed plants offer an additional advantage in that little difficulty from stoppages is experienced. In any event, it is advisable so to regulate the temperature of the incoming gas and the solution that naphthalene stoppages do not occur.

Invited by the author to give his opinion of the new process, Mr. Warren S. Blauvelt, President of the Indiana Coke and Gas Company, at Terre Haute, who had had a plant running for some weeks, replied that this system of purification seemed to him a distinct advance on the older methods in (1) cost of installation per unit capacity; (2) ground area required; (3) uniformity of results; (4) lower purifying costs; (5) practical elimination of explosions; (6) less "neighbourhood nuisance;" and (7) probable reduction in the corrosion of gasholder lifts, services, house piping, and meters, due to the removal of cyanogen in purifying. There is still another great advantage in this process, added Mr. Ramsburg—namely, the ability to have cheap purification costs without admitting any oxygen to the gas. Further, complete purification by means of the liquid process is but a matter of comparison in cost and convenience. Into this matter, also, the Koppers Company are inquiring.

The paper contained various operating data, from which the following figures have been extracted.

Seaboard Bye-Product Coke Company.

Year 1922.

Gas treated:	
Total for 1922, c.ft.	8,563,323,000
Daily average, c.ft.	23,500,000
Hydrogen sulphide in inlet gas:	
Average, grains per 100 c.ft.	346
Range of monthly averages, grains per 100 c.ft.	228 to 534
Maximum on individual tests, grains per 100 c.ft.	800
Hydrogen sulphide in outlet gas:	
Average, grains per 100 c.ft.	31
Hydrogen sulphide removed:	
Per cent	91
Total for year, lbs.	3,858,090
Per lb. soda, lbs.	7·24
Soda ash used:	
Total, lbs.	532,800
Per 1000 c.ft. (including overflow), lb.	0·062

Battle Creek Gas Company.

June, 1922, *to February*, 1923.

Gas treated:	
Average, c.ft., per week	9,840,000
Maximum, c.ft., per week.	11,521,000
Minimum, c.ft., per week.	8,559,000
Hydrogen sulphide in gas:	
Average, grains per 100 c.ft.	311
Maximum weekly average, grains per 100 c.ft.	449
Minimum weekly average, grains per 100 c.ft.	196
Hydrogen sulphide in outlet gas:	
Average, grains per 100 c.ft.	34
Maximum, weekly average, grains per 100 c.ft.	66
Minimum weekly average, grains per 100 c.ft.	18
Average removal of hydrogen sulphide p.ct.	89·1
Soda ash used:	
Average per week, lbs.	186
Average per day, lbs.	27
Average per 1000 c.ft., lb.	0·01888
Hydrogen sulphide removed per lb. soda ash, lbs.	35·8
Solution circulated per 1000 c.ft., gallons	59
Air used per gallon of solution	72

Hydrocyanic Acid Gas to Destroy Pests.

The United States Department of Agriculture have, states "Industrial and Engineering Chemistry," completed a series of experiments which have demonstrated the practicability of using hydrocyanic acid gas in destroying animal pests in their burrows. This highly toxic gas has long been recommended for destroying pests in buildings, but heretofore has not been considered applicable for use out of doors. It is pointed out that hydrocyanic acid gas will not replace carbon bisulphide for general use in destroying burrowing rodents, but that conditions are sometimes encountered when a more deadly and quick-acting gas is required. A good example is the woodchuck, which has the habit of closing his burrow behind him on the approach of danger, and often resorts to this means of shutting-out the ill-smelling carbon bisulphide. Hydrocyanic acid gas acts too quickly to permit the animal to shut it out, and its odour is not objectionable. The deadly nature of the gas, and the need of caution in handling both it and the ingredients used in its production, are emphasized, though it is stated there need be no hesitancy in employing the method, if directions are closely followed. Instructions for using this gas may be had upon application to the Biological Survey, United States Department of Agriculture, Washington.

Stanton Spun Iron Pipe.—A description is given in the current issue of the "Engineer" of the latest developments of the centrifugal pipe-casting machine devised in 1914 by M. Sensaud de Lavaud. During the last seven years, a considerable amount of work has been done on the perfecting of the machine and the manufacturing process; and important developments have simultaneously taken place in Great Britain, Canada, and America. In England, the Stanton Ironworks Company, Ltd., have secured the manufacturing rights of the process for the British Empire—excluding Canada—and also for the continent of Europe. This Company have not only secured the use of the De Lavaud patents, but they have laid down the entirely new plant for the economic and scientific manufacture of spun iron pipes, which our contemporary describes and illustrates.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

A Monthly Synopsis of Recent Technical Publications.

By H. J. Hailstone, of Rochdale.

Coal Ash.

The melting point of the ash of coal and coke has long been regarded as an important factor affecting the nature of the resulting clinker and the ease or difficulty of clinkering operations, whether performed mechanically or by manual labour; but there is considerable difference of opinion as to their precise relationship. Much valuable research work has been undertaken on this matter from time to time; and in a recent paper before the Manchester section of the Society of Chemical Industry, Messrs. Sinnatt, Owles, and Simpkin have reviewed some of the previously published work, and have described further investigations. In older methods of determining the melting-point of coal ash, the material has been formed into a cone and heated till it would bend or run. Slight differences in size and shape had a marked effect on the results obtained, and the nature of the surrounding atmosphere caused discrepancies; a reducing atmosphere usually causing the material to melt at a lower temperature. In the method employed by the authors mentioned, the finely powdered and sieved coal sample is ignited, and the resulting ash ground-up, sieved, and worked into a paste with 10 p.ct. dextrin solution. This paste, when pressed through a small die, emerges as a narrow thread or rod, which is allowed to dry, and may then be cut into short lengths for the actual melting-point determination. A sample is mounted on a piece of platinum foil and is placed in a silica tube. This is heated in a magnesia block furnace with an oxygen coal-gas flame, and the temperature at which melting occurs is measured with a pyrometer, the couple of which is placed close to the sample in the furnace. By this method very small samples can be tested and concordant results obtained.

Coke from Japanese Coals.

Owing to the high proportion of volatile matter present in Japanese coals, hitherto there has appeared to be considerable difficulty in producing in bye-product ovens coke of sufficient strength for metallurgical work. How this difficulty may be overcome is described by K. Shimomura in "Chemistry and Industry." In order to render unnecessary the admixture of anthracitic coals, the author patented his method, which consists of first distilling off a portion only of the volatile matter at a temperature below 600° C., and quenching the resultant semi-coke, which should contain between 15 and 25 p.ct. of volatile matter. This product is ground, and is mixed with two to three times its weight of the untreated coal. The mixture, when carbonized in the usual manner in the coke-oven, yields a good grade of coke.

Synthesis of Methane.

The description of the first portion of an important work carried out by S. Medsforth in the laboratory of the South Metropolitan Gas Company has appeared in the "Transactions" of the Chemical Society. Under certain conditions, the interaction of carbon monoxide and carbon dioxide with hydrogen results in the formation of methane and water vapour. Using nickel as a catalyst, it was found that large increases in catalytic effect were produced by the presence of certain rare earths. In the formation of methane, catalytic effect was measured by passing mixtures of CO and H_2, or CO_2 and H_2, at different speeds through a heated tube containing the catalyst—nickelized pumice with various additions of thoria, ceria, or other oxides. The explanation of the quickened reaction is given that nickel acts both as a hydrogenating and a dehydrating agent in the course of the reaction; and in using an additional agent, such as thoria, the nickel is somewhat relieved of the latter function, and is able to serve more energetically the former. As another instance of the action of catalyst and promoter, the case of the incandescent mantle is mentioned; the large proportion of thoria on the mantle acting as an oxygen-carrying catalyst in the combustion process, while the trace of ceria present acts as the promoter, and speeds-up the reaction.

Separation of Gases.

Details regarding the separation of carbon monoxide from mixtures of carbon dioxide and hydrogen have been considered in connection with a study dealing with gases which were evolved in a fermentation process; and Messrs. Blair, Wheeler, and Reilly have read a paper on this topic before the London section of the Society of Chemical Industry. The principle of the separation method was based on the solubility of carbon dioxide in water; and in order considerably to reduce the volume of liquid used, the whole washing system was worked under a pressure. According to Henry's Law, the quantity of gas taken up by a given volume of solvent is proportional to the pressure of the gas. The authors, however, found that the carbon dioxide dissolves slightly less readily at the higher pressures than the law indicated. Working on this knowledge the subject was further developed by a graphical method, and was applied to an experimental plant whereby a mixture containing 60 p.ct. of CO_2 and 40 p.ct. of H_2 was passed at a pressure of about 160 lbs. per sq. in. through two towers containing packing, and was washed by a descending

stream of water. At the exit a gas containing only 5 p.ct. of CO_2 and 95 p.ct. of H_2 was obtainable.

GAS ANALYSIS.

The use of phosphorus as an oxygen absorbent in the analysis of flue gases has not been so widely practised as might have been the case, probably owing to the slowness with which the absorption takes place. This was due to the formation of a coating of somewhat inert material upon the surface of the sticks of phosphorus, which renders them less active. The foreign material seemed to be caused partly as a result of the action of light and partly by chemical action of traces of other reagents finding their way into the phosphorus pipette. The former factor was largely eliminated by coating the pipette with black varnish; and it appears, from some practical information published by A. Holmes in "Industrial and Engineering Chemistry," that the phosphorus may easily be rendered more active. As the use of pyrogallol is by no means free from disadvantages, this information should stimulate employment of the phosphorus method in certain cases. The rate of absorption of the oxygen is quickened-up by the presence of a trace of bromine. The gas to be tested is previously passed through bromine water, and in this condition is more rapidly freed from its oxygen when transferred to the phosphorus pipette. Contamination on the surface of the sticks may be removed by treatment with concentrated nitric acid or aqua regia while in the pipette, and subsequent removal and replacement of the acid with fresh water. This treatment somewhat restores the reagent to its light yellow colour and renders it very active for a time.

SPECIFIC GRAVITY OF GAS.

The apparatus described by Messrs. Weymouth, Anderson, and Fay in "Industrial and Engineering Chemistry," though used for indicating the specific gravity of natural gas, could doubtless render equally good service with coal-gas and water-gas mixtures. The gas under test is drawn through a small orifice and long capillary tube immersed in a water jacket to maintain a constant temperature. Differential gauges, filled to the correct height with xylene, are fitted at each side of the orifice and capillary; and when a current of gas passes through the apparatus a drop in pressure occurs in each. By maintaining a constant pressure drop through the tube, any variations of the pressure drop at the orifice serve to indicate corresponding changes in specific gravity. After standardization with known gases, the gauges may be calibrated to give direct readings; and charts are available to make corrections for differences in temperature and pressure.

MICROSCOPICAL INVESTIGATION.

The application of the microscope to industrial problems has not received the attention it deserves from gas-works chemists; and the remarks of H. B. Milner at a meeting of the Royal Microscopical Society should stimulate further interest in this branch of study. The use of the microscope has long been established in the control of certain industries—notably in the iron and metal trades, in engineering work, and in cement, glass, and refractory manufacturing operations. Its scope in the gas industry has already been extended to the examination of coals and coke and refractory materials. The microscopical examination of oxide of iron before and after use in gas purification could be of considerable assistance in locating unsatisfactory material and local abnormalities in the boxes. In the manufacture of dry neutral sulphate the microscope affords a ready means of detecting and measuring the amount, breakage, and size of the crystals.

A NEW FILTER.

The "streamline filter" described by Prof. Hele-Shaw at a meeting of the London section of the Society of Chemical Industry introduces a new feature into the field of industrial filtration; and many fresh applications for its employment in chemical operations will doubtless quickly come forward. The instrument was described in the "JOURNAL" for July 18 (see p. 307).

North of England Gas Managers' Association.—The autumn meeting of the Association is to be held at Bridlington, under the Presidency of Mr. J. Kelly (Manager, Secretary, and Engineer of the Bridlington Gas Company), on Friday, Sept. 21, at 2 o'clock.

Fan Standardization.—In common with other branches of engineering, the necessity for standardizing the terms used in stating the performance or capacity of fans, and also the method of testing fans, has been apparent for some time, both to the users and to the makers. The Council of the Institution of Heating and Ventilating Engineers some time ago appointed a Committee, known as the Fan Standardization Committee, having representatives of both fan manufacturers and users, together with representatives from the Admiralty and H.M. Office of Works. This Committee have been holding meetings at regular intervals since the spring of last year. They find that there are many difficult problems to settle, and that very considerable differences of opinion exist, both among the fan makers and also among the users, as to the correct terms to employ, and as to the best method of testing fans. They hope, however, eventually to clear-up all misunderstandings and ambiguities, and to issue a standard list of terms, as well as to define a standard method of fan testing and a clear method of listing fan performances.

THE VENTILATION OF PUBLIC BUILDINGS.*

FOLLOWING immediately in the wake of the volume entitled "Calculations in Heating and Ventilation," which was reviewed in the "JOURNAL" for July 18, is another publication dealing with the subject of ventilation in an entirely different manner. "The Ventilation of Public Buildings," by Robert Boyle, is a compilation of the opinions of eminent scientists and the views of Royal Commissions and Select Committees appointed by Parliament regarding the respective merits of natural and artificial methods of ventilation.

The applications of gas to lighting and heating are inevitably interwoven with problems of ventilation; and consequently any new light which may be shed upon the vital question of ventilation cannot fail to be of importance to the gas industry. The new volume is entirely devoid of personal expression. If books were divided into two classes—human and inhuman—"The Ventilation of Public Buildings" would unquestionably fall into the latter category. In spite, however, of this somewhat mechanical impression, the undoubted reliability of the statements gives it a definite value.

The balance of evidence is in favour of natural ventilation, whereby vitiated air finds its exit through suitably disposed outlets at or near the highest point of the room or building. This method obviates the distressing necessity of re-inhaling either one's own combustion products or those of others, and, at the same time, possesses the advantage of freedom from the running costs and considerable expenditure of installation which any system of artificial ventilation entails. This brings to mind the case of a certain church in a small township where during sermon time a peculiar lassitude fell upon the congregation, who rapidly developed a state of semi-coma. This was due neither to tradition nor to a lack of eloquence on the part of the preacher, but was entirely traceable to thick blankets of expired air, which, unable to find an outlet, and being reduced in temperature, descended to breathing-level. An immediate and permanent remedy was found in the installation of a gas ventilating light, which formed an exit-shaft for exhaled air and assisted in its removal at a sufficiently rapid rate. The results were pleasing to the congregation and most gratifying to the pastor, who found a fresh spur to effort in the alertness of his listeners.

One of the extracts in the book emphasizes the importance of diffusion. A quiescent condition of the air is unhealthy. Incessant movement of the atmosphere, states Parkes, is a law of Nature. It is good to read this and other extracts of a like character, because they all point to the important part which gas plays in promoting health by setting-up and maintaining the very conditions which make for efficient ventilation. Gas not only produces a state of turbulence, but also provides the aero-motive force, by reason of the decreased density of its products of combustion and that of the air surrounding the burner, which results in a continual and steady air flow through the room. Moreover, such ventilation is free from the disagreeable draughts concomitant with artificial methods, as, for example, the use of electric fans. It is not without some amusement that we read an extract from a paper on "Ventilation" presented to the Society of Arts: "The application of the electric fan has up to now done little more than substitute a thorough draught, the least tolerable of all discomforts to an Englishman. I could take you to a large smoke-room in town where a fan is at work on one side of the room, where it is so draughty that no one will sit there. At the other side of the room it is suffocatingly hot, with no apparent movement of air."

Yet another extract points a moral. This is by Prof. R. H. Smith, who states that: "The true idea of perfect ventilation is to supply and extract only a moderate excess of air—say, five to ten times as much, over that actually used." When it is remembered that the coal fire extracts twenty-five times as much air as is actually used, that a gas-fire extracts eight times as much, and that the electric fire does nothing at all in this respect, further comment is unnecessary. Another section of the book deals with the supply of warmed air; and it is stated by an eminent American engineer that: "The premature loss by Americans of the freshness and bloom of youth may be attributed to the enervating effects of the warmed-air systems of ventilation." Without enlarging on this, a certain sense of satisfaction is experienced in the realization that over 50 p.ct. of the heat from a gas-fire is radiant energy.

* "The Ventilation of Public Buildings," by Robert Boyle, to be published on Aug. 1 by Robert Boyle and Son, No. 64, Holborn Viaduct, E.C. 1. (Price 6s. net.)

British Industries Fair.—It has been arranged that the British Industries Fair, 1924, shall be held from April 28 to May 9, and that the Birmingham section will open on May 12, finishing on May 23. In selecting these dates, it was appreciated that the holding of the British Empire Exhibition from April to October must materially affect the attendance of overseas buyers, since it was unlikely that the visitors from any of the Dominions would make two journeys in a single year. While the British Industries Fair and the British Empire Exhibition have a common object in the promotion of British trade, their activities are in no way competitive, but rather complimentary.

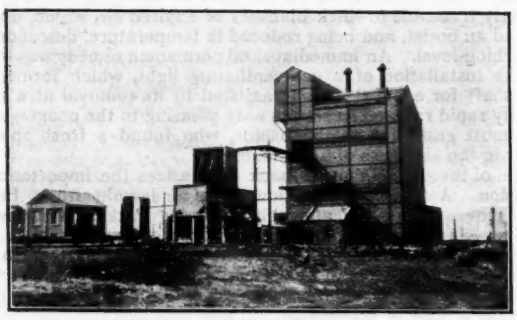
NEW GAS-WORKS AT DUMBARTON.

For a fortnight past Dumbarton has been supplied with gas from new works the formal opening of which it is expected will take place in October. The site on Dumbuck estate comprises an area of 10 acres. This will amply allow of any further extensions to retort-benches or gas storage which may be necessary to satisfy the future needs of the town. The site has been well chosen for its admirable railway facilities for the handling of material into and out of the works; and the surroundings are such that amenity is in no way interfered with.

The Glover-West Installation of Vertical Retorts.

The most imposing structure is undoubtedly the retort-house, which is of the usual Glover-West design, rising to a height of 80 ft., and comprising the latest methods of coal carbonization. The plant consists of two settings of retorts built in units of two—*i.e.*, sixteen retorts in all, each measuring 21 ft. by 2 ft. 9 in. across the major axis of the elliptical section. Provision is made in the steelwork for a future extension. The plant will deal with about 50 tons of coal, and yield about 750,000 c.ft. of gas per 24 hours.

The subsoil being of a soft consistency, and a hard stratum being difficult to find, it was necessary to carry the retort-bench, producers, building, coal-breaker pit, and coal-store wall on pile foundations. There are 94 of these piles, each measuring 14 ft. by 14 in. square section by 55 ft. long, made in reinforced concrete by Messrs. M'Bride to the design of Messrs. L. G. Mouchel and Partners. After these were driven, the pile heads were stripped and re-concreted with the beam in the case of walls, or with the raft in the case of the retort-bench producers and breaker pit, forming the foundations at the surface.



The Glover-West Verticals at Dumbarton.

Each set of four retorts, being heated by a separate producer, is entirely independent. Each unit of two retorts is also independent, and any unit can be put out of operation at will, without affecting the action of adjacent retorts. The Glover-West system of complete control over the heating of the units has been justified in many successful installations; and it will suffice to state that the intensity of heating can be varied at will from the top to the bottom of the retort by separate dampers at each floor-level, thus making the plant capable of carbonizing any coal under ideal conditions. The elliptical shape of the retort has the advantage of combining great rigidity and resistance to distortion with a maximum heating surface. The retorts are heated by gas generated in producers of the step-grate type readily accessible from ground level. No clinkering is required. All that is necessary is to clean the fire and remove the ashes at convenient intervals. The retort-bench is housed in a steel-framed, brick-panelled building, measuring about 80 ft. from ground level to apex. The roof of slates on steel angle purlins is carried on braced steel trusses supported from the coal bunkers.

Coal is delivered in wagons from the neighbouring railway, and is hauled by a locomotive to two hydraulic tippers which drop the coal into a 10-ton hopper over the coal breakers. Here powerful rotating claws break the coal into suitable size for carbonizing; and the coal is fed into a conveyor of the well-known West gravity-bucket type, which elevates the coal above the level of overhead steel bunkers of a capacity of 48 hours' supply. Coal not required in the bunkers falls down a shoot into the coal store which adjoins the retort-house, and which is capable of holding about 700 tons of broken coal. Side-tipping wagons run on lines in the store, and may carry coal to the breaker pit in place of the railway delivery. From the overhead bunkers above the retorts coal passes into the retort hopper, its passage being controlled by a valve, and thence into the retort as required.

Coke is collected in the chambers below the retorts, which are emptied at regular intervals into side-tipping wagons. These are pushed on rails into the lift, and hoisted to the coke-hopper level, whence they leave the retort-house by a gantry leading to the screening plant. The coke is tipped over a bar-type screen, which takes out the smalls (below 1 in.). The latter fall into a central compartment of the reinforced concrete hopper, and the two outer compartments receive the large coke. Coke flows as required into railway wagons on the metals running under the hopper, or into lorries or carts at the side. The worms extracting the coke at the base of each retort are driven by two gas-engines of the "National" type. All other power for coal breaker, conveyor, lift, and hydraulic tippers is provided by electric motors.

Other Plant.

The gas is conveyed from the retort-house to the condensers, which are of the water-tube type. These were erected at the old works in 1912, and being in splendid condition and of ample capacity, were dismantled, overhauled, and re-erected on the new site. This plant has a working capacity of 1,250,000 c.ft. per day. The exhausters, which are in duplicate, are of the two-blade type, and were erected at the old works in 1911-12. Fortunately, they were in excellent condition, and being in duplicate it was possible to remove them, and at the same time maintain a continuous supply of gas to the town during the transition period.

The tar extractor and the Livesey washer have a daily capacity of 1,000,000 c.ft. each. A Holmes rotary brush scrubber is used for extracting ammonia, and is capable of dealing with 1,250,000 c.ft. per day. This plant, with the exception of the Livesey washer, was salved from the old works.

The purifiers form part of the newly-acquired plant. They were made originally to the order of the British Admiralty for one of the air stations, but were not erected owing to the conclusion of the war. The plant consists of four boxes 30 ft. by 25 ft. by 5 ft. deep, designed for a capacity of 1,500,000 c.ft. of gas per day. They are fitted with Clapham's patent "Triumph" valves. The station meter is another item of plant removed from the old works. It was erected in 1904, and has a capacity of 40,000 c.ft. per hour.

The gasholder (erected by the Barrowfield Iron-Works Company, Ltd.) has a capacity of 750,000 c.ft. The tank is constructed of steel plates. Its dimensions are 107 ft. diameter and 32 ft. 6 in. deep, resting on a reinforced concrete foundation 18 in. to 21 in. in thickness. The holder is of the spiral-guided type.

The trunk main from the new works is 18 in. internal diameter; and it is connected with the largest existing distributing mains between the old and new works, with a view to affording in the future a more equal pressure over the whole area of supply. There are commodious offices, workshops, and stores, boiler house, mess-room, and a well-equipped laboratory.

The planning and entire supervision of the work were entrusted to Mr. James Bell, Gas Engineer and Manager to the Dumbarton Corporation. That the Town Council did well in reposing such confidence and trust in him is, says the local "Herald," borne out by the expert evidence of Mr. Doig Gibb, O.B.E., M.Inst.C.E. Reporting to the Gas Committee on the plant and general scheme of the new works, he stated that he entirely approved, and really could not suggest any improvement in the various items or lay-out scheme. The success which has attended the execution and completion of the work, adds the "Herald," reflects much credit on the Manager, the Gas Committee, and the various contractors, who have efficiently and thoroughly carried out their respective contracts.

THE MICROSCOPICAL INVESTIGATION OF COAL.*

Considering the importance of coal, comparatively little is known as to its nature. Bone remarks in his book, "Coal and Its Scientific Uses:" "The various organic bodies, which together form what is sometimes termed the 'coal substance,' are all compounded chiefly of the elements carbon, hydrogen, oxygen, nitrogen, and sulphur, the relative proportions of which may be determined with considerable accuracy by the usual methods employed for the analysis of organic compounds generally. But the ascertainment of the nature of the various complexes which make up the coal substance, and still more so of the relative proportions in which they are present in any particular coal, is a problem beset with such difficulties that its solution has hitherto proved well-nigh beyond achievement by any known method of chemical attack."

Of late, greater importance has come to be attached to the microscopical examination of coal; and it is hoped that further research on these lines will shed light on much which at present is shrouded in mystery. The practical application of the knowledge obtained by the examination of thin sections of materials is becoming of increasing interest commercially. In the case of coal, the interpretation of the observations is of great complexity; and on this account the subject may be considered to be developing somewhat slowly. But the reason for the scanty attention paid to this method may, perhaps, be found in the difficulty associated with the actual preparation of the transparent slices. It is consequently of interest to record the publication by the Lancashire and Cheshire Coal Research Association of a treatise on the preparation of coal for microscopical investigation, written by J. & J. R. Lomax, who, as is well known, have concentrated on the subject for many years, and have achieved a great deal in this direction. It is work requiring the finest precision and considerable experience.

In Bulletin No. XIV. of the Association, the authors describe

* "Transparent Preparations of Coal for Microscopical Investigations." By J. & J. R. Lomax. Published by H. F. & G. Witherby (Publishers to the Lancashire and Cheshire Coal Research Association), No. 326, High Holborn, W.C. (Price 2s. net.)

in detail the preparation of the sections. They indicate the methods of encountering difficulties arising from the disintegration of the coal, and emphasize the desirability of cutting the sections as soon as possible after the coal has been mined, lest changes—due to oxidation, for example—should occur in its characteristics. Mention is made of the difficulty caused by the presence of occluded gases. Most, if not all, coals contain within their substance gases which are slowly evolved at ordinary temperatures as soon as the coal is exposed to the air. They are supposed to be present either in solid solution in the coal substance, or under high pressure within the minute pores or interstices of the coal. Their rate of evolution is accelerated by heating the coal or by crushing it; and as the operations necessary to prepare a section involve grinding, the evolution of gases must be countered. The most satisfactory method of dealing with this, it is stated, is to maintain the block of coal from which the section is to be cut for several hours at a temperature a few degrees higher than that to which it is likely to be subjected throughout the remaining operations. This preliminary heating also serves to remove all moisture, the presence of which militates against satisfactory results. This is but one of many practical considerations treated by the authors; and it is felt that the work entailed in the preparation of the publication will meet its reward in the assistance given to those who are endeavouring to elucidate the mysteries of coal by the laborious method of microscopical investigation.

An opportunity is here afforded to draw particular attention to the value of the work done by such investigators as J. & J. R. Lomax, Sinnatt, Stopes, and Booth, who have done much to assist in the classification of coals. It is generally recognized that two coals may have identical chemical compositions as determined by customary methods of analysis, and yet one may be applicable to a process for which the other is wholly unsuited. The methods of classification, adopted by Regnault, Seyler, and others, depending on the ratio of the carbon to the hydrogen or that of the oxygen to the carbon, are open to objection; and to be in a position to select coal, an idea of its mode of formation, as well as its chemical characteristics, is desirable. This brings to mind a paper presented to the Iron and Steel Institute by A. L. Booth in 1920 [*vide* "JOURNAL," Vol. CLI., p. 621], in which, as a result of microscopical analysis, he divides coals into three main classes: (1) Humic coals, composed of leaves, stems, and broken-down woody tissue, together with some spores. (2) Spore coals in which "micro" and "mega" spores predominate. (3) Cannel coals, containing small round yellow bodies, which, it is suggested, are algae or microscopical animal life. He states that for steam-raising humic coals which contain a proportion of cuticle are most suitable; that for town-gas manufacture humic coals containing a considerable percentage of spores should be chosen; and that for producer-gas work, spore coals are best. The best coking coals are those containing yellow resinic constituents; and for direct fired furnaces hard coals should be employed. This serves as an indication of the vast practical importance of the work for the advancement of which the authors of the treatise under review have done so much.

Heating of Shops.—Two very useful and well illustrated articles on the heating of shops are to be found in No. 113 of the British Commercial Gas Association's "Thousand-and-One Uses for Gas." The systems described—gas and coke—are equally applicable to small as to large showrooms and shops, and what is said in these articles will therefore prove of the widest possible interest.

Manchester and District Junior Gas Association.—There is to be a visit of members on Saturday afternoon, Aug. 11, to the Great Harwood Gas-Works of the Accrington Gas and Water Board, where they will be met by Alderman D. C. Dewhurst and members of the Gas-Works Sub-Committee. After tea, with Mr. and Mrs. A. J. Harrison as host and hostess, a paper will be read by Mr. H. B. Knowles, of Lancaster, on "Possibilities of Carbonization."

Internal Combustion Engine Castings.—The research being carried out jointly by the British Cast Iron Research Association, the Motor Research Association, and the Motor Cylinder Research Association, is reaching a stage when some beneficial results may be expected. Engine cylinders made in this country and abroad have been examined and reported upon. Castings to variable specifications have been made, and are now being subjected to test.

Meter Readers as Canvassers.—The "Gas-Age Record" reprints the suggestion that the meter reader should be made more valuable to the gas company, as he can become a very useful point of contact. It would, it is said, be a great advantage to a gas company to know just how each consumer used gas; and a series of half-a-dozen questions could be arranged which every meter man could ask, and which would be answered readily. The replies might be so indicated on the consumer's card that the advertising man could clearly visualize the consumer's home. Those who did not use gas ranges or water heaters could be circularized on the particular appliance that they lacked. The meter man might be compensated either according to the number and quality of his reports or on the sales which accrued as a result of his effort.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Refractory Materials—Research Committee Report.

SIR,—I regret that lack of time prevented the usual discussion following the reading of the above report, as I was somewhat anxious to express my approval of the stand taken by Mr. Broadberry regarding the slow progress made in the research work.

I have read the notes prepared by Miss D. Jones, B.Sc., and W. Amery; and while these are helpful, they do not carry us very far. I think it will be generally agreed that if we are to obtain a satisfactory yield of therms per ton of coal, especially in the case of horizontal retorts, it is necessary to work retort settings at considerably higher temperatures than has been the practice until recently. I feel we have arrived at a time when some guidance is required as to the materials to be used in the construction of retort settings. Experience of past working is of little use to us now that temperatures in the neighbourhood of 1400° C. are required.

With these heats, my experience is that fireclay retorts are no longer suitable; and if a reasonable life is to be obtained, the retorts, as well as the division walls, must be made of silica material. During a visit to the United States about two years ago, and also on a recent visit to the Continent, I found that silica segmental retorts were being generally used.

The introduction of silica material, however, brought in its train many troubles not hitherto experienced, especially in regard to expansion and the effects of the rate of heating up and cooling down; and I feel that the Refractory Materials Committee should make a special effort to give information which will be of service to the gas industry generally. Considerable work, of course, has been done in the laboratories of some of the larger undertakings, and at Beckton we are paying great attention to the subject; but I am of opinion that co-operation through a recognized research centre, adequately supported, would facilitate matters. The amount granted by the Institution of Gas Engineers for research on refractory materials is, in my opinion, much too small to obtain good results in this very important subject. The importance of the problem is borne home when we reflect that the cost per ton of coal of resetting retorts is equal to about one-half the labour charges.

The stand taken by Mr. Broadberry was undoubtedly a very necessary one; but I hope he will see his way clear to continue with the work, and that he will receive the necessary support to produce some helpful information.

W. B. LEECH.
Engineer.

Beckton Station, July 26, 1923.

REGISTER OF PATENTS.

Rotated Gas-Heated Cylinders for Drying or Roasting Grain.—No. 198,764.

SHARP AND PRESTON, LTD., and DOCKING, A., both of Dublin.

No. 6650; March 7, 1922.

This invention relates to improvements in rotated gas-heated cylinders, for drying or roasting grain and the like, of the kind in which the cylinder is constructed with a hollow axle or axial casing with burners disposed therein. As hitherto constructed, the products of combustion or hot gases have been conveyed from the hollow axle to an external jacketed space, or a fixed chamber in which the cylinder is located, by means of radial pipes, the inner ends of which are directly connected to openings in the hollow axle. The object of the present invention is to obtain greater efficiency.

Accordingly, the hollow axle is enclosed in a concentric inner casing, so as to provide an enclosed annular space between the axle and the main part of the cylinder, and the products of combustion are conveyed from this annular space to the outer jacketed space by a series of radial tubes, the inner ends of which are connected to openings in the concentric inner casing.

Wet Gas-Meters.—No. 199,446.

FOX, T., and ROBINSON, S., both of Liverpool.

No. 8002; March 20, 1922.

The object of this invention is to obtain a wet meter which for its size will pass considerably greater quantities of gas than meters of the same size hitherto made, and which may easily be taken to pieces and assembled when it is necessary to replace any worn parts.

The specification is long and detailed; so we take the following constructional features from the claims.

The meter comprises a single chamber adapted to contain the auxiliary parts, which are removably secured thereto; the meter casing being a single sheet of metal constructed in the form of a cylinder and closed at the back and front by dished plates rigidly secured to it. The inlet pipe is mounted at the front of the cylindrical casing, and the outlet pipe on the rear plate; and the waste-water box is secured to the casing by means of a hollow screwed plug projecting through the casing and secured by a nut and washer on the outside, while the bottom of the box is attached by a union joint to the waste-water pipe.

The bearings for the drum spindle are arranged one in a diametral support removably attached to the cylindrical casing, and the other on a pipe screwed into the rear plate of the meter; and the drum spindle is mounted in a tube integrally connected with the drum, and is secured thereto by a split pin.

A pipe screwed into the rear plate of the drum is adapted to connect the gas and water outlet pipes with a chamber on the outlet side

of the drum. This pipe comprises a tubular portion connected with a hollow boss externally threaded and adapted to screw into the rear plate of the meter; the tubular portion extending vertically upwards to a point above the water level. A crank, mounted on the drum spindle, engages a slotted arm which moves a spoon up and down within the waste-water box to maintain the water in the meter at a constant level.

The above-mentioned diametral support carries a lug forming a bearing for a vertical spindle connected to the driving wheel of the indicating mechanism.

Gas-Saving Plates.—No. 184,181.

STANDEN, H. S., of Waverley, N.S.W., and EVANS, H. P., of Abbotsford, N.S.W.

No. 20,981; Aug. 1, 1922. Convention date, Aug. 1, 1921.

This invention relates to an improved gas-saving plate that is placed over a gas-burner for the purpose of deflecting the flame on to more than one pot or saucepan. The plate is circular in shape, but parts are removed at intervals, leaving (say) three sectional openings between projecting arms.

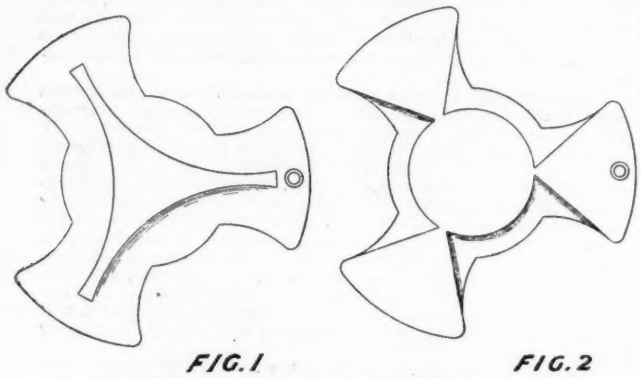


FIG. 1 FIG. 2

A Well-Designed Gas-Saving Plate.

Fig. 1 is a plan view of the top of the plate; and fig. 2 is a view of the under-side.

On the top of the plate, which is made of metal, are curved stops against which the body of a pot may come while over the deflected flame; and on the under surface is a shallow central boss. On the under side of the arms the metal is also thickened, the surface being preferably in the same plane as the central boss and running thereinto.

Heating by Gas.—No. 199,478.

ALEXANDER, C. J., of Argyle Street, W.C. 1.

No. 8652; March 25, 1922.

This invention consists in exposing the surface of a refractory body to the direct contact of one or more inverted bunsen flames. Heat-absorbing material such as porous fire-brick serves well; and an embodiment of the invention is to mount a brick in the space above a flame-impinged brick, surrounding them with casing in the form of a stove for room-heating.

Manufacture of Neutral Sulphate of Ammonia. No. 199,475.

LESSING, R., of High Holborn, W.C. 1.

No. 8615; March 24, 1922.

In introducing this patent for the avoidance of discolorations of the salt upon neutralizing ordinary sulphate of ammonia, the patentee states that he has found that, unless the colour-giving impurities have been abstracted from sulphate of ammonia or have never been allowed to enter into its composition, processes of neutralization are bound to produce undesirable colour changes which of necessity take place in the presence of moisture, such as preparing the salt in the saturator with an excess of moist ammonia gas, or washing the salt with ammoniacal or alkaline liquors, or neutralizing it generally in the presence of moisture.

He points out that ordinary sulphate of ammonia containing the usual impurities, and notably salts of iron, will yield a neutral product practically without darkening—or at any rate with a negligible change of colour—if its moisture is substantially removed before the neutralizing agent is added, or before an amount of neutralizing agent is added sufficient or more than sufficient to effect complete neutralization of the product.

In carrying out the invention, ordinary sulphate of ammonia, which has a slightly acid reaction, is treated by any known method—preferably by agitation and the application of heat—so that its moisture is substantially removed; and subsequently a neutralizing agent in a dry state is added. Any of the solid agents adapted to effect neutralization which are mentioned in patent No. 141,787 (of which Dr. Lessing is a joint patentee) or ammonia gas are suitable for carrying out the process.

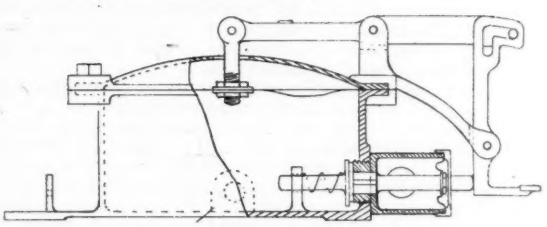
In any case where the sulphate of ammonia contains an excessive amount of free acid, a portion of this free acid may be neutralized before or during the removal of moisture, provided the salt is substantially dry before neutralization is completed. This course is also recommended where the reaction of the requisite amount of neutralizing agent with the free acid or other impurities would produce more than a permissible amount of moisture. The percentage of residual moisture which may be regarded as permissible depends on the degree of freedom from colour-change which is desired, and on the composition of each individual batch of sulphate of ammonia in regard to impurities. While colour change is avoided when carrying out the process, the material so treated should afterwards be kept as free from moisture as possible, for change may take place if the sulphate is subsequently exposed to moisture—particularly if it contains an excess of neutralizing agent.

Automatic Gas Cut-Off Valves.—No. 199,532.

SMITH, W., of Hull.

No. 10,135; April 10, 1922.

This invention, for an automatic gas cut-off valve, comprises, as will be understood from the drawing, a chamber with an open end and fitted with a flexible diaphragm. In place of the diaphragm may be fitted a bell with a liquid seal, or a bellows arrangement. The chamber has an opening for the admission of gas, and a valve which is preferably screwed in. The diaphragm is inflated or deflated according to the pressure of gas inside the chamber, with the opposing pressure of a spring working against the movement of the main lever. Other details are clear from the drawing.



An Ingenious Cut-Off Valve.

On the diaphragm seeking to rise with the pressure, the finger press is operated to open the valve, and the pin falls to the bottom of an L-shaped slot; and thus the valve is held open against its spring. It remains in this position until a lowering of pressure causes the diaphragm to fall; the apparatus then returning to the position shown in the drawing.

Coke Chambers for Gas-Generators.—No. 199,801.

MOORE, S., of Regents Park, N.W. 3, and HUNTER, CHARLOTTE, of Gordon Square, W.C. 1.

No. 8895; March 28, 1922.

This invention refers to apparatus for receiving and delivering coke from gas-generators—more particularly those of the vertical type—for the manufacture of both coal gas and water gas.

The patentees' claims cover apparatus for receiving and delivering coke comprising a casing positioned below the gas generator, a rotary or other valve mounted within the upper part of the casing and adapted to deliver coke thereto, a hinged bottom plate adapted to receive the coke from the valve, an outlet from the chamber, means to close the outlet in a substantially air-tight manner, and means for actuating (swinging) the bottom plate to such a position within the chamber that the coke will slide through the outlet.

A plate is mounted, and held in position by a counterweight, so as to coact with the rotary valve within the chamber formed by the casing, for the purpose of permitting the passage of large or projecting lugs or pieces of coke through the valve.

Sprinklers for Gas-Scrubbers.—No. 199,847.

STILL, C., firm of, and KUHN, A., both of Recklinghausen.

No. 9878; April 6, 1922.

This invention relates to sprinkling devices for gas scrubbers, cooling towers, or similar apparatus, in which the liquid is fed to a tray from which it flows by means of a number of nozzles distributed over the horizontal base of the tray; the dimensions of the passages of the nozzles being such that a layer of liquid accumulates in the tray above all the nozzles. The uniformity of the liquid distribution over the whole plane surface of the scrubber depends largely upon the layer of liquid having the same thickness throughout the whole tray. It has been observed by the inventor that if the liquid is fed into the tray in a single jet, the necessary uniformity in depth cannot be attained.

In order to avoid this drawback, according to the invention means are provided by which the incoming liquid is led in from above and flows from the centre of the tray to its outer periphery, so as to avoid any disturbance of the liquid surface therein. For this purpose, a tapered hood is arranged inside the tray, the outer edge of the hood dipping into the layer of liquid in the tray; the incoming liquid being received at the centre and highest part of the hood. Thus, a continuous and uniform distribution of liquid on the whole surface of the material is attained irrespective of variations in the quantity of liquid supplied.

The arrangement is said to be simple and efficient; and it is suggested by the patentees to employ exchangeable nozzles in order to vary the discharge area for the liquid.

Vertical Retort Apparatus.—No. 199,929.

HUMPHREYS & GLASGOW, LTD., of Victoria Street, S.W. (a communication from R. M. SEARLE, of Rochester, New York).

No. 15,755; June 6, 1922.

Fundamentally this invention deals with the form and construction of the setting of vertical retort gas-making apparatus; its object being,

by introducing and embodying new modes of operation, to attain new and useful results and important advantages.

Of the drawings illustrating the setting, we reproduce: Fig. 1—a side view, partly in section, of one embodiment; fig. 2—a transverse sectional view illustrating the lower portion of the setting; figs. 3, 4, and 5—sectional views on the lines 3—3, 4—4, and 5—5 of fig. 2.

The setting is enclosed in a cylindrical shell of metal, and the ver-

Fig 1

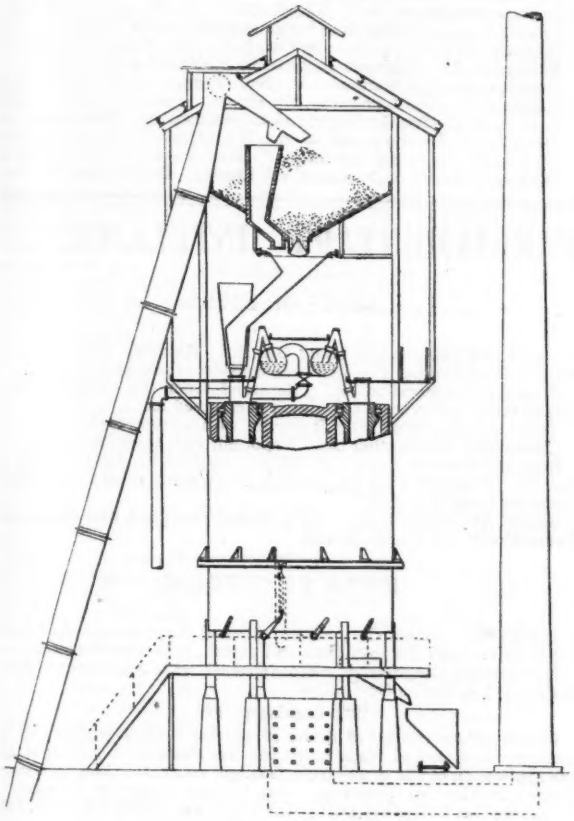


Fig. 2.

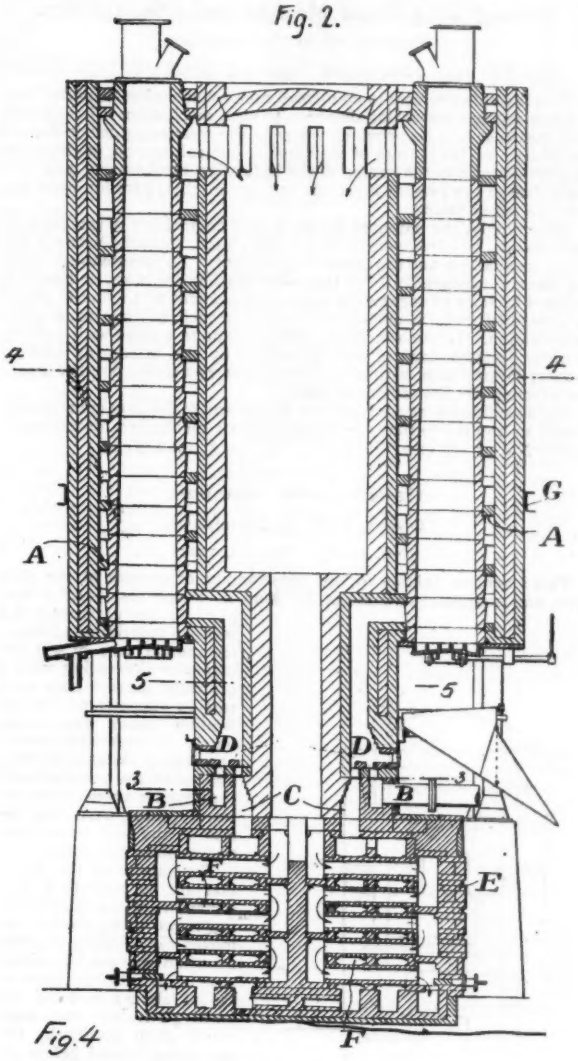


Fig.4

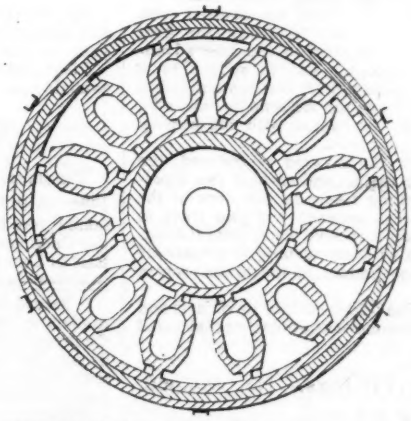


Fig.3

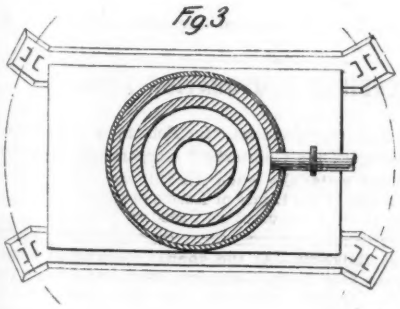
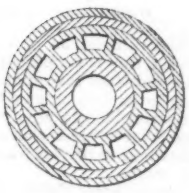


Fig 5



Novel Features in Vertical Retort Setting.

tical retorts are arranged in a circle. The hopper, with or without a breeze pocket, is stationary; and by providing it with a spout, turnable about a central axis, each of the retorts can be charged by a simple operation without moving the hopper or transporting its contents. A conveyor for charging the hopper and its pocket is indicated. As shown, the spout is carried by wheels which run on a circular track carried by the framework of the superstructure. Ventilation is provided through the superstructure when the retorts are charged, which benefits the conditions of operation.

The retort chamber is ring shaped in plan, and may be radially subdivided by partitions (see fig. 4), thus providing in effect an independent chamber between each two adjoining retorts. This provides for heating the retorts of the series and for attaining an accurate control of temperature in the various retort chambers. Each of the subdivisions of the retort chamber is shown as provided with baffle-plates A, which operate to distribute the heat to the best advantage. Gaseous fuel, admitted at B, meeting heated air delivered through the passage C, burns in the sub-divided combustion chamber D (figs. 2 and 5) and in the sub-divided chamber containing the retorts, and supplies the necessary heat for externally heating the retorts. Communication between each combustion chamber D and the corresponding passages B and C is controllable by dampers, so that the relative proportions of gas and air admitted to the chamber D, and the combustion therein, can be regulated. Products of combustion leaving the retort chamber descend through the central passage, traverse the heat-exchanger E, and escape by the stack. Air passes through the flues F, and is heated by the exchanger E in the usual manner.

At the discharge ends of the retorts the diameter of the setting is contracted to provide space for a discharge chute, arranged to travel on a circular track. This chute discharges clear of all the ironwork into a coke car, also adapted to travel on a circular track. G is a circular track upon which a chain or other hoist is arranged to travel so that it can be used for operating the levers of the retort bottoms. The chute may be provided with an air blast, which can be applied to the inner face of the bottom lids of the retorts, in order to clean them and insure their tight fitting. By off-setting and perforating the bottom of the chute, a hand-bar may be used for starting the discharge of the retorts without danger to the operator. The chute may be provided with a hinged section, which can be turned up to avoid the columns.

The specification describes other details of the setting, which include a spring expansion joint for the shell.

Setting Coin-Freed Mechanism.—No. 199,854.

SIMPSON, S., of Newton Abbot.

No. 10,128; April 10, 1922.

This invention relates to coin-freed meter mechanism provided with a screw and nut measuring device. In such mechanism it is desirable that means should be provided whereby the measuring device may be set to zero for the closure of the valve or control member of the meter without disturbing the setting of the indicating mechanism; and it is the object of the present invention to carry out this operation from outside the meter casing.

Accordingly, the patentee adopts means comprising a ratchet-and-pawl device, or a free-wheel or one-way clutch, disposed between the meter mechanism and the measuring element. To operate the measuring element independently of the meter mechanism, a key or handle is adapted directly to engage the measuring element or a spindle geared or connected with the measuring element in such manner as to effect its operation. Or such member may be made to engage with a pinion or other device connected with, or carried by, the measuring element—being formed with teeth or provided to carry a pinion or other means for effecting the desired engagement.

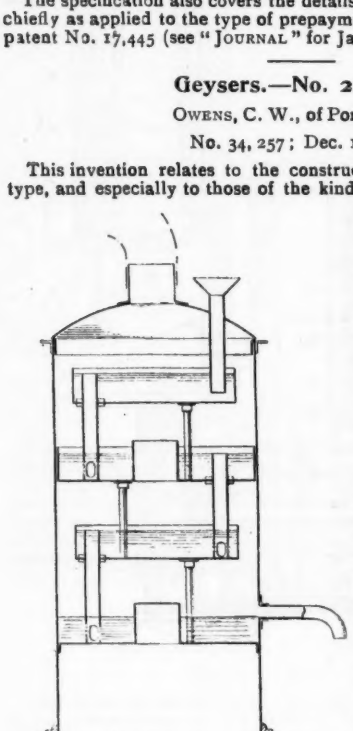
The specification also covers the details and features of construction chiefly as applied to the type of prepayment mechanism described in patent No. 17,445 (see "JOURNAL" for Jan. 4, 1922, p. 39).

Geysers.—No. 200,028.

OWENS, C. W., of Pontardawe.

No. 34, 257; Dec. 15, 1922.

This invention relates to the construction of geysers of the open type, and especially to those of the kind in which the water is supplied to the uppermost of a series of superimposed trays; an annular tray of a larger diameter alternating with a centrally located tray of a smaller diameter, so that the heating gases pass alternately through the central openings of the annular trays and round the peripheries of the smaller trays, while the water passes from the top tray to the next lower tray, and so on to the outlet.



Owens' Open-Type Geyser.

The objects of the invention are to provide a construction which permits of the trays being readily removed for cleaning or other attention without the necessity of employing tools or skilled labour; to avoid the burning-out of the trays which often occurs by the gas being lighted before all the trays are covered with water; to utilize the heat supplied to the best advantage; and to reduce to a minimum the contamination of the descending water by its contact with the heating gases.

Accordingly, as will be seen from the drawing reproduced, the lowest tray is supported by the outer casing, and each of the superimposed trays is supported by legs resting freely on the floor of the next lower tray, one or more of such legs between any two trays in the series being a pipe with an open top to receive water from the surface level in the higher tray, and also with an opening at or near its lower end to deliver water close to the bottom of the lower tray of the couple.

The patentee claims that his invention differs both in its objects and details from a previously proposed and somewhat similarly constructed geyser.

Flexible Connection for Gas-Fittings.—No. 199,966.

YEOMANS, E. S., of Kettering.

No. 19,898; July 20, 1922.

This invention has for its object to provide an improved flexible tubular connecting member for gas-fittings, which is not liable to splitting or distortion, and by which a fluid-tight connection may be readily made.

The invention consists essentially of a flexible connection comprising a tubular member of rubber or like expansible material having an annular flange of greater diameter at each end; a closely-coiled spring wire or strip being wound on the outer surface of the tubular member between the flanges, and the ends of the wire or strip being left free, so that the spring layer may expand when the tubular member is expanded to fit over a nipple or the like.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 25.]

Nos. 18,268 to 18,835.

ASHMORE, BENSON, PEASE, & CO., LTD.—"Gasholders." No. 18,347.
BARRS, E.—"Production of coke from small coal." No. 18,340.
BURN, L.—"Gas-fires." No. 18,631.
CUMMINS, F. B.—"Gas-retort settings." No. 18,705.
DAVIES, W. E.—"Carbonization, gasification, or distillation of fuels, &c." Nos. 18,813, 18,814.
DUNN, J. W. & M.—"Gas-generators, &c." No. 18,568.
FALL, F. P.—See Ashmore, Benson, Pease, & Co., Ltd. No. 18,347.
FOX, J. T.—"Gas-analysis indicator." No. 18,395.
GAS LIGHT AND COKE COMPANY.—"Rotary scrubbers, &c., for the manufacture of gas." No. 18 343.
GLOVER, J. A. F.—See Burn, L. No. 18,631.
HODGSON, J. L.—"Rotary meters." No. 18,695.
HORSNAILL, H. F.—"Incandescent gas light." No. 18,296.
LAING, B.—"Heat treatment of solid carbonaceous materials and manufacture of briquettes." No. 18,461.
LEASK, E. A.—"Safety flues for geysers, &c." No. 18,496.
MALONE, A. J. & J. F. J.—See Fox, J. T. No. 18,395.
MORINEAU, A.—"Gas heater for baths." No. 18,475.
NEGRIER, P.—See Morineau, A. No. 18,475.
NIELSEN, H.—See Laing, B. No. 18,461.
NODEN, T. J.—See Gas Light and Coke Company. No. 18,343.
SHAPLEY, C. S.—See Leask, E. A. No. 18,496.
WEEKS, E. G.—"Fuel distillation." No. 18,412.
WEYMAN, G.—"Combustion of solid fuels." No. 18,692.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The South Staffordshire Mond Gas Bill: Returned from the Commons with amendments, which were considered and agreed to.

Plymouth Corporation Bill: Returned from the Commons with amendments, which were considered and agreed to.

Torquay Corporation Bill: Reported, with amendments.

Chesterfield Corporation Bill: Reported, with amendments.

Swanage Gas and Electricity Bill and Lytham St. Anne's Corporation Bill: Returned from the Commons with amendments, which were considered and agreed to.

Smoke Abatement Bill: Read a second time, and committed to a Committee of the Whole House.

HOUSE OF COMMONS.

Lytham St. Anne's Corporation Bill and Swanage Gas and Electricity Bill: Read the third time and passed, with amendments.

Macclesfield Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Gas Regulation Act.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under the Gas Regulation Act, 1920, on the application of the Bromsgrove Gaslight and Coke Company, Harpenden District Gas Company, Urban District Council of Horncastle, Wrexham Gas Company, Derby Gas Light and Coke Company, and Whitchurch (Salop) Gas Company, Ltd.

Coking and Bye-Product Profits.

Mr. WHITELEY asked the Secretary for Mines the amount of coking and bye-product profits for the years 1920, 1921, 1922, and up to June 30, 1923.

Lieut.-Colonel LANE-FOX replied that the information was not available.

CHESTERFIELD CORPORATION BILL.

The clauses in this Bill (see "JOURNAL" for Feb. 14, p. 385, and for June 20, p. 749) relating to the Chesterfield Corporation gas undertaking were not amended materially when the Bill was considered by the Unopposed Committee of the House of Lords, presided over by the Earl of Donoughmore (Lord Chairman) on Tuesday, July 24.

Record Output at Dalkeith.—At the annual meeting of shareholders of the Dalkeith Gas Light Company, held last Friday, the Chairman (Mr. Eben. Dawson) intimated that the Directors had decided to reduce the price of gas from 5s. 5d. to 5s. per 1000 c.ft., as from the last survey. He also mentioned that the make of gas for the past year exceeded 30 million c.ft., which constitutes a record for the Company.

Free Gas for Unemployed.—At Millom, in Cumberland, free gas is being supplied for the benefit of the unemployed; the Furness area being in sorry plight owing to the slackness in the engineering and shipbuilding industries. Recently, the Gas Committee have had to inquire into allegations that the privilege has been abused; the suggestion having been made that people other than the unemployed used the free gas. A Sub-Committee are investigating the matter.

Modernizing Gas Lighting in Schools.—Last year the Education Committee reported to the London County Council that they had approved a scheme for the improvement of the gas lighting of the Council's educational institutions, and had decided to consider the extension of the scheme at the end of a year. As the result of the year's working, they have decided to develop the scheme, which enables the Council to meet the bulk of the expenditure by payments spread over a period of six years. As the proposals involve expenditure in subsequent financial years, it is necessary to put forward estimates of cost; and they have recommended: "That the estimates of expenditure on maintenance account submitted by the Finance Committee in respect of the modernization of gas lighting in the Council's educational institutions for the following financial years, 1924-25 £6000, 1925 26 £4000, 1926-27 £4000, 1927-28 £4000, 1928-29 £2000, be approved as estimates of costs, debt, or liability under section 80 (3) of the Local Government Act, 1888."

LEGAL INTELLIGENCE.

ACTION OVER AN ESCAPE OF GAS.

No Negligence on the Part of the Wandsworth Gas Company.

At the Kingston County Court, last Friday, a case was heard which was the sequel to a gas explosion in Worple Road, West Wimbledon, on Sunday evening, Jan. 14. Between 8 and 9 o'clock on the night in question Samuel Coombs, a cable-layer in the employ of the Wimbledon Corporation, in company with another employee, J. H. Stenning, was sent to Worple Road to locate a fault in the high-tension main of the electricity supply. On taking the cover from a manhole, gas was detected; and it was left open for ten minutes. No smell being then noticeable, Coombs prepared to descend with a hurricane lamp; two lamps of a similar nature being placed on each side of the hole. There was an explosion, in which both men were injured, Coombs being the greater sufferer. Coombs thereupon brought an action against the Wandsworth, Wimbledon, and Epsom District Gas Company, his claim being for four weeks' wages, £14 8s. 8d.; hospital fees, £1 16s. 6d.; special food and nourishment, £4 10s.; and damage to trousers, 10s. 8d. In all the claim was for £47 15s. 1d.; but damages were agreed at £31 17s., and the only question for his Honour was liability—it being contended by plaintiff that the explosion was due to the negligence of the Company, or their servants, in failing to keep the main pipes in repair.

Mr. HERBERT JACOBS (instructed by Mr. G. E. H. Bellingham) was for the plaintiff; the Gas Company being represented by Mr. FOX-ANDREWS (instructed by Messrs. Sloper, Potter, and Gosden).

Plaintiff stated that he had been a cable-layer for 23 years, and in all respects had followed the usual practice in trying to locate a defect. At the expiration of ten minutes, he could not detect any smell of gas in the manhole, which was about 5 ft. deep and 4 ft. 6 in. square. He put his face to within 6 in. of the hole before attempting to descend. Through the explosion he was severely burnt on the face, arms, and hands. He could not say what kind of gas had found its way into the manhole; but one of the Company's gas-pipes was only about 2 ft. away.

Stenning, who was assisting Coombs, gave corroborative evidence, and in cross-examination said he was contemplating bringing an action against the Company. Another Corporation employee, visiting the spot the following morning, said the road had been dug up, and men were there in the employ of the Gas Company. He could smell gas at the time.

This closed the case for the plaintiff; and Counsel for the Gas Company contended there was no case to answer, as gas was not in the nature of a wild beast which required special precautionary measures. Even if gas had escaped, there was no evidence of negligence, and no notification had been given.

After legal arguments, his Honour held that there was a case to answer.

An underground plan of the locality having been put in, Mr. Joyce, a district inspector to the Company, said that at 10.45 on the night of the explosion he was informed of it, and, collecting a gang of men, went to the scene. There was a considerable smell of gas; but after digging for some hours no source of it could be found. Operations were continued next day; and a reducing socket was discovered to be defective. One end of the socket was screwed into the main, and it connected with an inch pipe running into the house. He considered it to be a very dangerous thing to have used a hurricane lamp in the way that plaintiff described.

Mr. C. M. Croft, Chief Engineer to the Company, said the pipe was laid in 1912. The normal life of a pipe was 25 years; but they were renewed after 20 years. There was corrosion of the socket which screwed into the pipe; but no means existed of detecting such a condition, apart from a smell of gas, which indicated that something was wrong. In this instance gas had leaked from the corroded socket, but without any evidence until the cover of the manhole was removed for investigation purposes.

An expert said another manhole should have been opened to create a draught at the first sign of gas.

After hearing Counsel, his Honour said he had come to the conclusion (1) that the explosion was caused by an escape of coal gas; (2) that the gas escaped from a defective reducing socket; (3) that the metal of the socket was defective when it was put in; (4) that the defect was a latent one which could not have been discovered by reasonable care on the part of the Company. There had not been negligence by the Company, for whom judgment would be given, with costs.

Pudsey Gas Company's Reduction.—The announcement is made by the Pudsey Gas Company of a reduction in the price of gas, as from July 1, to 9·2d. per therm.

Price Again Reduced at Hastings.—In announcing that, as from the midsummer readings of the meters, the price of gas: o ordinary consumers of the Hastings and St. Leonards Gas Company will be reduced by ½d. per therm (2·3d. per 1000 c.ft.), and to prepayment consumers in proportion, Mr. C. E. Botley (the Engineer and General Manager) says that the current price therefore becomes 1s. per therm, or 4s. 7·2d. per 1000 c.ft. This is the fourth reduction since 1921, or an aggregate of 1s. 7·8d. per 1000 c.ft. (4·3d. per therm). The declared calorific value of the gas is 460 B.Th.U.; but the gas supplied during the half-year, as tested, averaged 469·8 B.Th.U. It is pointed out for the information of consumers, as affecting the price of gas, that current coal contracts show on the average an increase of 2s. 6d. per ton over the previous ones, and that there has been no further adjustment in labour costs. This latest reduction, it is pointed out in the notice, anticipates that there will not be another increase in the already high cost of coal.

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND STANDARD GAS PRICES.

At last week's meeting of the London County Council, Mr. H. Marks asked the Chairman of the Public Control Committee whether any reply had been received to the Council's application to the Board of Trade under section 1 (3) of the Gas Regulation Act, 1920, for an Order reducing the standard price applicable to the Gas Light and Coke Company, and when the report of the expert, Mr. Arthur Valon, might be expected in regard to the Commercial Gas Company and the South Metropolitan Gas Company.

Mr. Cyril H. M. Jacobs replied that, in accordance with the rules formulated by the Board of Trade under the Act, 28 days' preliminary notice of an intended application had to be given to the Gas Company concerned, and to the local authorities in the Company's area of supply. In the case of the Gas Light and Coke Company, the notices were given on July 3 last; and the formal application to the Board of Trade would be made after the expiry of the period. The Board had been informed of the step which the Council proposed to take. The expert's report as regarded the Commercial Gas Company was expected at an early date; so that if the Council decided to make application in this case also, it could be proceeded with immediately after that of the Gas Light and Coke Company. The South Metropolitan Gas Company were not at present subject to the Act, as regarded standard price; but an opportunity for revision of the standard price must be given by the Company not later than the parliamentary session of 1925.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Cheadle Rural District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 7s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 4d. per therm.

It is also proposed that an additional charge of 2d. per therm should be authorized in respect of gas supplied through a prepayment meter.

SPECIAL ORDER.

Penryn Gas Company, Ltd.

Application is to be made by the Company to the Board of Trade under section 10 of the Act for a Special Order authorizing them to construct and maintain gas-works on scheduled land; to supply gas within the borough of Penryn and the parishes of St. Gluvias and Mabe and part of the parish of Budock Rural, in the rural district of East Kerrier, Cornwall; to raise additional capital; to fix the price of gas; and to regulate the supply.

DECLARATIONS OF CALORIFIC POWER.

Batley Corporation.—440 B.Th.U. (July 27.)
Doncaster Corporation.—470 B.Th.U. (Sept. 1.)
Formby Gas Company, Ltd.—450 B.Th.U. (Oct. 1.)
Maryport Urban District Council.—450 B.Th.U. (Aug. 1.)
Pontefract Corporation.—450 B.Th.U. (July 30.)
Sandown Gas and Coke Company, Ltd.—450 B.Th.U. (Oct. 1.)

GAS REGULATION ACT ORDERS.

There have been forwarded by the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Accrington District Gas and Water Board.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 13·3d. per therm. (July 25.)

Lampeter, Llandyssil, Tregaron, and Aberayron Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16·5d. per therm. (July 23.)

Little Hulton Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 11·4d. per therm.

Prepayment meter clauses are included. (July 26.)

Oldbury Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm. (July 23.)

Pontefract Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15d. per therm. (July 23.)

Skipton Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 11d. per therm. (July 23.)

Dividends in respect of the half-year ended June 30 have been declared by the Tottenham District Light, Heat, and Power Company at the rates (less income-tax) of 5 p.ct. per annum on the preference stock, 8 p.ct. per annum on the "A" stock, and 6½ p.ct. per annum on the "B" stock—payable on Aug. 11.

SOUTH METROPOLITAN CO-PARTNERSHIP FESTIVAL.

Once again the Crystal Palace has been the scene of a South Metropolitan Gas Company Co-Partnership Festival; and once again have all those concerned in its organization full reason to congratulate themselves, and full claim to be congratulated, upon the success which attended their efforts. The task of preparing and carrying out the programme was no light one; but not a hitch could be discerned anywhere. Last Saturday—the festival day—there was a popular innovation; for the Company had decided on this occasion to dispense with the annual dinner, at which perforce places for but a few of those interested could be found, and to substitute for it a gathering of all co-partners and their wives, with arrangements for tea and an afternoon of sport and music. This meant the sending out of over 7000 invitations—a large family party, and one for the accommodation of which, even in the Crystal Palace, special plans had to be laid.

The part of the day's proceedings which took place in the grounds was (in spite of unpromising conditions in the morning) favoured by the fine weather which has so often been a feature of these gatherings; and large numbers witnessed the many keenly contested events. There were swimming and other races, together with a water polo match, in the boating lake; the Swimming Hon. Secretary being Mr. J. W. Morfill, and the Referee and Starter, Mr. J. H. Kimber. The sports meeting—of which Mr. A. E. Bickerton was Hon. Secretary and Mr. F. Day Referee—included races of all kinds for competitors of all ages. Good work had certainly been done by the Organizing Secretary of the Sports, Mr. A. Coleman. Special mention may be made of the inter-station and depôt relay race for the "Carpenter" cup and gold medals, and the road race from the East Greenwich works main gates to the Crystal Palace and finishing two laps on track. The South Metropolitan Gas Company's Military Band (Conductor, Mr. Sydney Herbert) played selections during the afternoon.

A QUARTER-OF-A-CENTURY OF CO-PARTNERSHIP.

After tea, there was the co-partnership meeting in the centre transept and on the great orchestra; and here Dr. Charles Carpenter, C.B.E. (the President of the Company), was busily engaged for some time in distributing countless exceptionally valuable prizes which had been won in the afternoon's contests. Those with him on the platform included Mr. Frank H. Jones (Vice-President), Mr. Frank Bush, Mr. Honoratus Lloyd, K.C., Mr. T. Manley, Mr. W. Beard, and Mr. P. Richbell (Directors), Mr. Frederick M'Leod (General Manager), Mr. F. Day (Secretary), and a number of other officials.

The PRESIDENT then gave a brief address on co-partnership and what it means. He said they had met that day to celebrate the thirty-fourth anniversary of the founding of the South Metropolitan Co-Partnership. Unfortunately, the number of those alive to-day who shared the task of laying that foundation thirty-four years ago was very small, and was growing smaller still; and, for the benefit of those who were present on an occasion of this kind for the first time, he would like to take the opportunity of saying a few words in description of what the co-partnership really was. Sir George Livesey, who was the founder of their co-partnership, had passed a great portion of his life in trying to put the organization of gas undertakings in relation to the public on a broader and sounder footing than had hitherto existed; and for many years he had pressed upon all the importance of making the public partners with the undertaking supplying them with gas. Having succeeded in this endeavour, the next task he undertook was to enlist the sympathies of those who were interested in his proposal to include the workers and co-partners in that partnership. In the first instance, he met with a great deal of opposition; and the strongest opposition was that of a section of the employees themselves. This opposition culminated, towards the end of 1889, in a great strike; but since then the soundness of his views had become more and more apparent. As time went on, it became more and more completely understood that in the way proposed by Sir George Livesey, and in this manner only, one could look for a solution of the problem of the unifying of the interests of capital and labour. Throughout this period, the Company had not only proved that Sir George was right in his endeavours, but year by year had solidified the structure built upon the foundation he laid.

What was the co-partnership to-day? Its principle was a very simple one. In order to carry on an industrial undertaking, it was necessary to have capital; and the basis of their co partnership in its relation to capital was that capital was entitled to something for its use and for what it gave. Parliament had settled this something at 5 p.c. The other basis pertained to labour. On the one hand, their obligation to capital was the payment of the moderate interest he had named for the use of the money it provided; and, on the other hand, the co-partnership entailed the obligation to pay the rates of wages which were considered fair and general in the various trades employed, or in other cases whatever might be the market rates for the acquisition of such services. Their co-partnership also included that very important body too often left out of calculations of this kind—namely, the public. When Parliament decided upon this scheme of co-partnership, the public were protected by the fixing of the basic or standard price for gas. The Company were entitled to charge this price, and to deal with capital and labour in the manner he had suggested. But Parliament went further, and said that, if the Company were able to make profits on a greater scale than was necessary to meet the three primary obligations, of this surplus profit three-quarters should go to the consumers in lowering the price of gas, and the remainder should be divided into two equal parts—one part going to the capitalist, and the other part to the employee co-partners.

But their co-partnership had done very much more than this; it had made better citizens of those who had become co-partners. He did not think one could have had a better example of this fact than what he might call the co-partnership attitude during the great war. The proportion of those who took up arms in the service of their country was greater in the case of the South Metropolitan Company than in that of any other company in the kingdom. Besides this, through their War Fund Committee, they accumulated a large fund, which enabled those who were away to have no misgiving as to the welfare of those who were near and dear to them, and whom they had left behind. These were two examples which might fairly be taken as an illustration of the educative value of the co-partnership. But, in addition to this, there was the testimony of those who came into contact with their employees in various ways. On every hand, there was tribute to the care with which they did their work, to the energy which they brought to the execution of their duties, and to the courtesy with which they carried them out.

The co-partners for many years past had elected their representatives on the Board of Directors; and almost as long as the co-partnership has existed—in fact, it was one of the first acts of the co-partnership—there had been a Committee entrusted with carrying out the very important duties pertaining thereto. For a space of something like one-third of a century, what he might call the welfare of the employees had been in the hands of a Committee, one-half of the members of which were elected by the employees. It was true that but a very small proportion could look forward to taking a seat on the Board of Management. A larger number, but still a comparatively small proportion only, could look forward to obtaining seats on the Committee of Management—the Co-Partnership Committee. But every co-partner could become a shareholder in this great undertaking. He ventured to suggest that being co-partners implied association with a great trust. The employees owed to themselves the duty of promoting the interests of the Company in every way, for, after all, they were their own. If the Company prospered, they were bound to prosper too, because the co-partnership was an unalterable one. It was a trust given by Parliament, and only Parliament could take it away again. He did not think even a Labour Parliament would try to do this. The co-partnership was on a foundation of security which could not be altered, which could not be undermined; and it was for them to recognize the great trust which devolved upon them as sharers in the co-partnership, and to leave no stone unturned to extend the prosperity of the Company and to place it in a stronger and stronger position to carry out its important duties.

As a reminder of what these duties were, the President recalled the fact that, not very long ago, for three long months not one ton of coal was raised from the mines of this country; but, he asked, what happened as regarded the supply of fuel for the purposes of cooking, warming, and lighting? All those millions of taps in South London, when they were turned on, responded to the hands which operated them, and provided light or heat, as the case might be; and not one of the inhabitants was conscious of any defect in that most important supply, because no defect in quantity or quality existed throughout the whole of that period. These thirty-four years of co-partnership had given the gas consumer great confidence. He knew he would always get his supply; for in all those thirty-four years there had been not only no strike, but no suggestion of a strike, among the employees. This showed that, properly united, capital and labour would work in harmony together for the general good.

If the co-partnership was a trust as regarded the employees themselves, it should also be a trust as regarded their children, because there was no reason why, when on reaching the superannuation age they went out of employment, children of their own should not be ready to fill these vacant posts. He was glad to say that he knew of many cases, not only where posts had descended from father to son, but also with credit and satisfaction from grandfather to grandson.

In conclusion, the President said he had recently seen in a paper an idea for providing work for the unemployed. It was to pull out all the gas-lamps in a borough, and put in electric lamps. Imagine what would happen if this were done. He supposed for every employee engaged in an electric light undertaking, there were half-a-dozen engaged in a gas-works; and the reason for this was that, instead of burning coal under the boilers, as the electric light undertaking did, at the gas-works the coal was treated in a scientific manner, and the valuable products were extracted from it. In this way, they had a large body of people carrying on the important work of the economic utilization of coal. He thought he was justified in asking them to do all they could to counteract this pernicious idea that the unemployed were going to be assisted by pulling out gas-lamps and putting electric lights in their place. (Applause.)

There was still more enjoyment in store for the huge audience—an assault-at-arms having been planned, including boxing, wrestling, an exhibition of self-defence by Mr. A. Coleman and Miss Ethel England, and a ju-jitsu contest in which Mr. Coleman worsted in succession (and in a remarkably short space of time) three opponents. Finally a dance programme by the Company's Co-Partnership Orchestra was gone through in the Australia Ballroom.

It was a happy celebration of a most successful co-partnership, which the passage of time is continually strengthening.

The Prestatyn Council, on Monday last, decided to reduce the price of gas, as from the end of this month, to 5s. 6d. per 1000 c.ft. for ordinary consumers, and 6s. for prepayment consumers.

A young boy named Campbell died of gas poisoning at Perth a few days ago. It appears that having complained of a headache, he and his mother had retired to a bedroom to rest during the afternoon. On the return of the boy's father, he found his son dead and his wife in an unconscious condition. It is surmised that while Mrs. Campbell was asleep the lad had accidentally turned on a gas jet.

At a recent meeting of the West Bromwich Town Council, the Gas Committee recommended that the price of gas for power, manufacturing, and lighting purposes be decreased by 3d. per 1000 c.ft., and that prepayment consumers be charged at the rate of 18 c.ft. per penny. Alderman Cox, moving the adoption of the resolution, said the report recommended itself better than anything he could say in support of it.

Last Saturday week the annual summer outing took place of the staff and employees of Burners (1921), Ltd., of Bromsgrove. Motor coaches conveyed the party on a 90-mile circular tour, embracing Stratford-on-Avon, Broadway, Cheltenham, Tewkesbury, and Worcester. At Stratford a stop was made for lunch and a trip by launch up the River Avon. At Cheltenham the company were entertained at tea by the Directors, three of whom (Messrs. Holmes Hunt, Kingdon, and Burgoyne) accompanied the party.

NATIONAL GAS EXHIBITION.

COMPETITIONS.

Among the features arranged for the forthcoming National Gas Exhibition, to be held in Bingley Hall, Birmingham, from Sept. 17 to Oct. 3, is an excellent series of competitions, leaflets giving particulars of which have been sent to all undertakings. These particulars include instructions and rules, forms to be filled in, and the following information regarding the competitions themselves.

ESSAY COMPETITIONS.

(Open to employees of gas undertakings only.)

All entries to be received not later than Aug. 31, and addressed to the Hon. Secretary, National Gas Exhibition, Gas Department, Council House, Birmingham.

Prizes:—First, £3; second, £2; third, £1; four of 10s.; eight of 5s. Further consolation prizes may be awarded at the discretion of the Committee.

SECTION 1.—*Open to all Employees of Gas Undertakings.*—Answer one question only. (A) Write a short essay on "The Public Health Aspect of Gas Service" (400 words); or (B) Describe how you would plan a scheme for developing the sale of gas for each of the following: (*a*) Heating, (*b*) cooking, (*c*) hot-water supply, (*d*) lighting, (*e*) wash boiler and irons, (*f*) power, (*g*) furnaces and other industrial appliances (600 words); (C) describe what you consider to be the ideal gas showroom with special reference to the plan and equipment of the interior (400 words); or (D) give suggestions for window displays dealing with each of the following: (*a*) Gas in the home, (*b*) gas for cooking, (*c*) gas for heating, (*d*) gas for hot-water supply, (*e*) for lighting, (*f*) for power and industrial purposes (600 words).

SECTION 2.—*Open to Superintendents, Foremen, and District Inspectors.*—Write a short essay on "The Principles I would follow in the Organization and Supervision of Labour" (300 words).

SECTION 3.—*Open to Gas-Fitters and Assistants.*—Answer one question only. (A) You are given an order to fix a gas-heated circulator in a house where the hot-water supply is heated by kitchen range; describe how you would handle the job from start to finish, giving a sketch of the boiler and connections (300 words). (B) You are given an order to fix a gas-fire in lieu of a coal-fire; describe how you would handle the job from start to finish (300 words).

SECTION 4.—*Open to Storekeepers.*—Answer one question only. Describe and give a rough sketch plan of what is, in your opinion, the ideal stores, having regard particularly to facilities for the storing, handling, and issuing of material in the case of (A) distribution and fitting stores or (B) gas-works or general stores (300 words).

SECTION 5.—*Open to Clerical Staff.*—Write an essay in concise form on "Scientific Costing in the Gas Industry."

SECTION 6.—*Open to Juniors, all grades, under 20 years of age.*—Write an essay on "My Plans for Success in the Gas Industry" (300 words).

SECTION 7.—*Open to Chemists.*—Answer one question only. (A) Give a percentage volumetric analysis of the gas you consider most economical to produce and consume, together with your reasons from each point of view (400 words). (B) Describe a satisfactory process for making neutral dry sulphate of ammonia from gas liquor, giving essential data as regards composition, quantities, &c., of gas liquor, steam, lime, sulphuric acid, waste liquor, and the neutral dry sulphate of ammonia. For what reasons is it preferable to make the above quality of sulphate instead of the ordinary sulphate? (600 words.)

SECTION 8.—*Open to Engineers' Assistants and Junior Technical Assistants.*—Answer one question only. (A) Contrast concisely the advantages of various sources of power for gas-works machinery (400 words). (B) Briefly describe what you consider the most useful instruments of recent invention for giving better scientific control of works' operations (400 words).

SECTION 9.—*Open to Gas-Works Foremen and Employees.*—State from your experience the particular lines upon which inventors should work in order to eliminate waste on gas works (400 words).

SECTION 10.—*Open to Meter Inspectors.*—Describe briefly how you would point out to the consumers in your district the advantages of the therm system of charging for gas (300 words).

ESSAY COMPETITION.

(For school children sixteen years of age and under.)

Entries must be received before Oct. 6, and should be addressed to the Hon. Secretary, National Gas Exhibition, Gas Department, Council House, Birmingham.

Prizes.—First, £2; second, £1; four of 10s.; twenty of 5s. Further consolation prizes will be awarded at the discretion of the Committee.

Write on a postcard an essay on: "What Interested me Most at the Exhibition, and Why."

COOKERY COMPETITIONS.

CHILDREN.

Prizes.—Sections 1, 2, 4, and 5: First, 15s.; second, 10s.; third, 5s.; and numerous consolation prizes. Section 3: First, £1; second, 15s.; third, 10s,; and numerous consolation prizes.

SECTION 1.—Schoolgirls. Open to all schoolgirls under 13. Plain cake, using not more than ½ lb. flour or ¼ lb. of flour and ¼ lb. of ground rice.

SECTION 2.—Schoolgirls. Open to all schoolgirls over 13 and under 15. Fruit pie or pastie, using not more than 3 oz. flour.

SECTION 3.—Schoolgirls. Open to pupils of technical and high schools. Fried fish, sultana scones.

SECTION 4.—Girl Guides, G.L.B., &c. Tea, toast, bacon and eggs.

SECTION 5.—Boy Scouts. Tea, toast, bacon and eggs.

ADULTS.

Prizes.—Sections 6, 7, 8, and 9, and each class in Section 10: First, £2; second, £1; third, 10s.; and numerous consolation prizes.

SECTION 6.—Cooks. Fried sole, grilled chop, tomatoes, chipped potatoes, sweet omelette.

SECTION 7.—Canteen Cooks. Yorkshire pudding, fruit pie, greens, boiled potatoes.

SECTION 8.—Domestic Servants. Tea, toast, rasher of ham, eggs and tomatoes.

SECTION 9.—Trained Nurses. Toast, lemonade, fillet of fish with sauce, custard pudding.

SECTION 10.—Home Cookery. Open to all women and girls except teachers of cookery and those engaged in the bakery trade. (1) 2 lb. loaf and six dinner rolls or tea cakes; (2) six sponge cakes, one jam sandwich, and one Swiss roll; (3) cake about 1½ lbs. and three varieties of small cakes (six of each sort); (4) meringues, macaroons, and fancy biscuits—four varieties (six of each sort); (5) puff or flaky pastry, two kinds of savoury patties, and two kinds of fancy tarts (four of each).

The dishes to be cooked in Sections 6, 7, 8, and 9 will be demonstrated in the course of the cookery lectures and demonstrations to be given at the exhibition by Miss Edith Sanderson.

The items for Section 10 must have been baked at home in an ordinary gas-cooker.

THE ROYAL VISIT TO WANDSWORTH.

A Welsbach Welcome.

London's largest borough—one of the chief industries of which is the manufacture of gas-mantles—was graced by a visit from their Majesties the King and Queen on Saturday last, the occasion being the opening of the new King George's Park in the valley of the River Wandle at Earlsfield.

The park is situated immediately opposite the factory of the Welsbach Light Company, Ltd., by whom special provision was made to ensure that their head office and works staffs had an opportunity of viewing as much as possible of the opening ceremony. On the Company's land facing one of the entrances to the park had been erected a huge stand (surmounted by a replica of the "Welsbach Light House") which commanded a view of the approaches, and afforded seating accommodation for about 250. The Company, while not overlooking their employees and staffs, availed themselves of the unique opportunity to invite a number of their business friends to partake of their hospitality; and many accepted the invitation.

The guests on arrival were received by the Chairman of the Company, Mr. J. R. Yates, and Mrs. Yates, and subsequently entertained to luncheon, at which the Chairman presided. After the repast, the visitors proceeded to the stand, the major portion of which was already occupied by the Company's employees; the girls being uniformly clothed in white overalls and caps. Although rain was falling when the visitors took their places, it by no means damped the enthusiasm of the assembly; and when their Majesties arrived on the scene they were accorded a tremendous ovation from the occupants of the stand. At the conclusion of the opening ceremony, the King and Queen left the park by the gates immediately opposite the Company's stand; and both employees and visitors joined in rendering the National Anthem to the strains of a band provided by the Company—the royal car halting while their Majesties waved acknowledgment.

After the passing of the procession, the party returned to the factory, where tea was served. At its conclusion, well-merited thanks were accorded the Company's officials for the excellent arrangements that had been made for the entertainment and comfort of the visitors. Acknowledgment was made by Mr. H. Talbot, the General Manager, Mr. Bark, the Works Manager, and Mr. A. R. Barford.

By this time the weather conditions had improved, and the employees were able to enjoy the delights of open-air dancing.

Tar-Distilling Plant on Fire.—Last week some alarm was caused by a tar-distilling plant at the Burton Gas-Works taking fire. The blaze was due to a crack in one of the pipes. Within a few feet of the distillation apparatus is a crude-benzole tank of a capacity of 2000 gallons. Fortunately, the workmen were able to keep the flames from the blazing tar away from this. The outbreak was speedily extinguished on the arrival of the fire brigade.

Newcastle (Staffs.) Gas Undertaking.—At a meeting of the Newcastle (Staffs.) Town Council on Wednesday last, it was reported by Alderman Scott (the Chairman of the Gas Committee) that the annual accounts showed a net profit of £2704, as compared with a loss of £1713 last year. After liquidating this loss, there remained a balance of £992. Alderman Scott said that credit was due to the Gas Manager (Mr. F. L. Wimhurst) and his staff. The consumers would have the benefit of a reduction of 8d. per 1000 c.ft. as from July 1, bringing the charge down to 4s. 1d.

Bridlington Purchase Question.—It appears that the gas situation at Bridlington is not yet settled. Some time ago, the Town Council secured expert advice on the value of the local Gas Company's undertaking from a purchasing point of view; but after vigorous protest against the proposal, the Council decided against purchase. At last week's Council meeting a lengthy discussion took place as to whether a special committee should be appointed to consider the expert's report; and it was eventually decided, by a narrow majority, to appoint such a sub-committee.

Reduction Decided upon at Edinburgh.—The Edinburgh Corporation Gas Committee, at a recent meeting, decided to recommend a reduction of 4d. per 1000 c.ft. in the price of gas, making it 3s. 8d. instead of 4s. The reduction will take place from May last. By the Committee's decision, part of the balance in hand will be applied to the reduction of old capital charges, while the remainder will benefit the consumer in lower prices. Since January of last year, steady reductions have been made in the price of gas in Edinburgh, which is now 2s. per 1000 c.ft. less than it was then.

UXBRIDGE GAS ORDER.

Mr. H. C. Honey (Director of Gas Administration at the Board of Trade) sat, on Monday of last week, to consider an application by the Uxbridge, Wycombe, and District Gas Company for a Special Order under section 10 of the Gas Regulation Act, by which they sought to amalgamate with them the Maidenhead Gas Company.

Mr. W. J. Jeeves, K.C., appeared for the promoters; and there was opposition by the Maidenhead Corporation, the Rural District Council of Cookham, and the Hillingdon Estate Company, represented by Mr. G. N. Keen, Mr. T. W. Stuchbery, and Mr. S. P. Kerr respectively.

Mr. Jeeves, in his opening statement, said that not only would the interests of consumers in the area affected by this proposed amalgamation not be prejudiced, but they would definitely benefit. The Maidenhead Company had seen the necessity for amalgamation, having been impressed with the difficulties with which they were confronted. The Maidenhead works were originally erected, in 1835, on a narrow piece of land; but it was not until 1876 that the Company were incorporated under the Maidenhead Gas Act. The limits were defined as the borough and several parishes outside. To-day, 63 p.ct. of the consumption was within the borough. In 1918 a Bill was promoted for the acquisition of land, among other things; but restrictions were placed upon the Company against using the land for carrying on manufacturing operations which would be detrimental to the neighbourhood. They had then endeavoured to purchase 3½ acres of land from Lord Desborough, but were unable to come to terms; and, pursuing their policy of endeavouring to meet the increasing needs of the district, the Company, in 1920 promoted another Bill, under which they sought to obtain compulsory powers against Lord Desborough. All they were able to do, however, was to get these powers, in respect of the 3½ acres of land, subject to a protective clause, the net effect of which was that the land was not to be used for any purpose except the erection of purifiers, which were to be of the best design and to the satisfaction of Lord Desborough. This position made it practically impossible for the Company to continue to supply gas in increasing quantities at the same reasonable rates at which they had supplied it previously. There was a definite prohibition by Parliament to use any part of that added land for the purpose of the manufacture or storage of gas.

Discussing the financial position of the Company, Counsel said that, from the last balance-sheet, the consolidated stock (5 p.ct.) amounted to £91,800, and mortgage debentures to £13,300. There had been expended on the works £84,746; and there was added, on the conversion of capital, £22,365, making a total of £107,111, from which had to be deducted £739 received in premiums. So that the total expenditure was £106,372, leaving the capital account overspent to the extent of £1272. All the accounts were in a good condition, and there was a carry-forward of £7328; so that the balance-sheet attested to the sound financial way in which the Company had been carried on. Up to December last the price of gas was 1s. 2d. per therm; but this was reduced, as from July 1, to 1s. 1d. per therm. The total capacity of the Maidenhead works, for coal gas, was roughly 280,000 c.ft. per day; and there were just sufficient purifiers for this amount of gas. They had two sets of water-gas plant, which enabled them to provide 350,000 c.ft. of water gas, making the total capacity 630,000 c.ft. The storage capacity was 322,000 c.ft. The demand had increased 24 p.ct. in the five years to 1917, and a further 33⅓ p.ct. in the five years to 1922. Practically the whole of this increase was met by more and more water gas. In 1913 the percentage of water gas to the total make was 28½ p.ct., and in 1922 it was 56 p.ct. The purifiers were insufficient for this. While the make of coal gas in 1913 was 82,000,000 c.ft., it had fallen to 76 millions in 1922; whereas the water gas had risen from 32 to 94 millions. He did not know of a much stronger fact than this to exemplify the extraordinary difficulties under which the Company had been providing for the requirements of the district. The demands were such that, in the early part of 1922, the Company were advised by their Engineer that it was necessary to make further provision for the supply of gas; and he had estimated that the cost of doing so would be not less than £30,000. The matter was considered very anxiously; and ultimately they approached the Uxbridge Gas Company, with whom they had come to an arrangement.

The Uxbridge Company, said Counsel, now had an area of 197 square miles. The undertaking had been built up by amalgamations with other companies, and by this process had secured the supply of cheaper gas from time to time for all the areas with which it had had to do. It had also secured the upkeep and repair of various works in a far better condition than such works were found to be in when they were taken over by this enterprising Company. It was originally incorporated, in 1861, as the Uxbridge and Hillingdon Gas Consumers' Company, and was authorized to supply gas in Uxbridge and certain adjoining parishes. Between that time and 1911 the Company were constantly extending their district in order to afford to unpiped areas the benefit of a supply of gas; and in 1911 they had purchased the Amersham Gas Light and Coke Company. In 1914 further capital powers were given, and, under their Act of 1916, the Company had amalgamated with the Eton Gas Company. The Company were entitled to charge an extra 6d. per 1000 c.ft. in this new area for five years, and thereafter an extra charge of 4d.; the price in the earlier area being 4s. 3d. As a matter of fact, this new area was separated from the rest of the Company's area by that of the Slough Company. In 1920 they obtained powers to amalgamate with the High Wycombe Gas Company; and the area now included High Wycombe and the adjoining parishes. Then came the Uxbridge, Wycombe, and District Gas (Charges) Order of 1921, which provided for a standard charge of 18·4d. per therm in the Company's internal area, as compared with 17d. in the Maidenhead Company's area, 19·2d. in the Eton area, and 19·6d. in the Wycombe area; the price in the latter being equivalent to 6d. per 1000 c.ft. in excess of the price in the Company's original area. Under the Uxbridge, Wycombe, and District Order, 1922, there was an amalgamation with the Great Marlow Gas Company, with power to charge 19·6d. per therm in this new area.

Financially, the Uxbridge Company were in a satisfactory position. The authorized nominal capital was £339,179. On Dec. 31 last there had been paid-up, on the ordinary stock, with a 5 p.ct. standard dividend, £172,294; and on the 5 p.ct. preference stock, £68,330. The finance was prudent, because nearly one-third of the stock was not subject to the sliding-scale, so that the consumer got the full benefit of any decrease in the cost of manufacture in respect of that capital, as well as 85 p.ct. of the advantage in respect of the remainder—the ordinary capital. The Company had had the benefit of £6472 in premiums up to December last—something like 3 p.ct. of the capital. Also, there was a total debenture debt of £42,881, which came out at just over 4 p.ct. on the average. This in itself was a definite tribute to the sound financial management of the Company. The position of the Company was such that they were able to defer going to the public for the necessary money to extend the works until April of the present year, when they had issued £60,000 of new capital. This was much over-subscribed, and was ultimately issued at a very considerable premium. The Company sold 380,000,000 c.ft. of gas per annum. The present price was 1s. 1½d. per therm, as compared with 1s. 1d. in Maidenhead; but the charge was to be reduced to 1s. 1d. from Sept. 29 next.

Mr. Keen asked if the price in Maidenhead was to be lowered in September.

Mr. Jeeves replied that, had it not been for the hope of this amalgamation going through, the price in Maidenhead to-day would be 1s 2d. per therm; and any hope of the price going down further depended wholly and solely on the amalgamation. Not only had the Uxbridge Company ample purifiers and mains, but a margin of capacity both for manufacture and storage. The individuality of the Maidenhead undertaking as to standard price of gas, standard rate of dividend, actual capital issued, and things of that kind, was preserved. There was a clause in the Order which transferred the officers and servants of the Maidenhead Company to the Uxbridge Company. It was proposed to carry on the existing offices, the only exception being that the name would be the Uxbridge, Maidenhead, Wycombe, and District Gas Company; and he did not suppose the consumer would notice any difference, except that he would find, in a year or two, that his gas was considerably reduced in price. The only benefit the shareholders of the Maidenhead Company could hope to get in the future would be by means of a reduction in price within the Maidenhead Company's limits. It was not advisable for the Maidenhead Company to spend the £30,000 which they would have to spend if they did not amalgamate, owing to the high prices prevailing, particularly as it could not be spent beneficially on the present site. On the other hand, the Uxbridge Company had spare plant available, as well as spare storage. They could avoid spending the money for some years, and to this extent would benefit not only both companies, but the nation, because they were enabling something which existed to be put to better use. There could be no doubt that any further supply of gas could be more effectually obtained by this amalgamation than by any other means. By amalgamation, the Maidenhead Company would be able to reduce the percentage of water gas to the neighbourhood of 20 or 30.

Dealing with the objections of the Maidenhead Corporation, Counsel said that to assert that the Company had no interests in Maidenhead, when such a large amount of capital was clearly dependent on the price charged in Maidenhead, was sheer nonsense. The Corporation's area only represented one-thirteenth of the Maidenhead Company's area. The attitude of the Maidenhead Company towards any proposal to sell to the Corporation would be one of unqualified opposition. As to the suggestion that the granting of this Order should be postponed, pending the promotion of a Bill for purchase, if the Board were to assent to any such proposition it would mean an end to the question of amalgamation, and to the benefit to the consumers which it was calculated to bring about. If it were in the interests of the public that the Corporation should purchase the undertaking, they could equally well do so after amalgamation as before. What earthly prospect was there, even supposing a Bill were promoted by the Corporation, of a Parliamentary Committee granting the powers referred to, in the teeth of the opposition of the Company? It could not be alleged that the Company had been lacking in their duty, or anything of that kind. The Corporation had no chance whatever of succeeding. The Cookham Rural District Council, in their objection, did not suggest that they should be allowed to purchase, though they might just as well as the Maidenhead Corporation. The Council, however, said that no advantage was to be gained by amalgamation, and that the price was likely to be increased; but he could only repeat that they had not realized the facts. The Council also strongly objected to the standard prices proposed by the Order, and suggested that the price fixed by the previous Maidenhead Order was too high. As to this, the Council had their remedy; and if this Order were granted, they would still have their remedy—application to the Board of Trade for a reduction. The Hillingdon Estate Company asked the Board of Trade to amend the general law relating to gas companies in regard to this undertaking. He would not discuss this, but contented himself with the submission that it was not a matter for the Board in relation to an Order of this kind.

Mr. *J. W. Walker* (Chairman of the Maidenhead Company) gave evidence. The Directors and shareholders of the Company, he said, approved of the amalgamation, in view of the difficulties which faced the Company in providing for the increased demand. His opinio based on professional advice, was that, even if his Company could put new works on their present land to meet the demands of the present and the immediate future, those demands would very quickly exceed the supply, and the only possible way to make provision for the future was by amalgamation with some such concern as the Uxbridge Company. If his Company had considered it likely that the amalgamation would lead to an increase in the price of gas, they would not have promoted it; and he was satisfied that by the suggested amalgamation the consumers and shareholders were more likely to benefit than by any other scheme he could devise. The Company were not willing to sell; and if the Corporation promoted a Bill to force their hands, the attitude of the Board would be to oppose it.

Mr. G. N. Keen then cross-examined, and quoted the prices charge

by the Maidenhead and the Uxbridge Companies respectively from 1913 to 1922, which showed that practically throughout the Maidenhead charges were the lower. He also quoted the capital expenditure in 1921 of the Maidenhead Company as £482 per million c.ft.; the corresponding figure for the Uxbridge Company for the same year being £743 per million. This was another wholesome element, he said, in favour of the Maidenhead Company.

Witness pointed out that they had to consider the conditions at the time, and the prospective liabilities.

Mr. JEEVES said that Mr. Keen, in working-out his figure, had taken the amounts of gas made, not the amounts sold.

Mr. KEEN then turned to the percentage of gas unaccounted-for. In 1922, the figure in the case of the Maidenhead Company was 9·7 p.ct. of the make, and for Uxbridge it was 12·1 p.ct.

Witness replied that he supposed really the difference was due to the new undertakings which the Uxbridge Company had acquired, and the consequent extensions and enlargements, which always resulted in a considerable loss of gas.

Mr. JEEVES, in regard to a remark by Mr. Keen that the Maidenhead shareholders had enjoyed a slightly higher dividend than the Uxbridge shareholders, pointed out that Uxbridge had averaged 5¼ p.ct., and Maidenhead $5\frac{7}{19}$ p.ct. over a period of eleven years; and if the period were extended a half-year, the balance might be a little the other way.

Mr. KEEN, examining the accounts of the two Companies, said that for the year to December, 1913, the total cost of manufacturing and distributing gas was 30·07d. per 1000 c.ft. in the case of Maidenhead, and 30·23d in the case of Uxbridge. In 1922 the costs had risen to 69·38d. and 74·85d. respectively.

Witness said he had not gone into it; but it might have been due to repair charges. In 1922 the Maidenhead Company had done all the repairs and maintenance necessary for the time being; but, as the amalgamation was pending, there were other things they might have done, but did not.

Mr. KEEN, referring to expenditure on repairs in 1922, said the figure for the Maidenhead Company represented 22·67d. per 1000 c ft., and for the Uxbridge Company 35·07d.

Witness, replying to questions as to how long the Maidenhead Company would be able to serve their consumers properly, if they were not amalgamated, said they would "about scrape through" this coming winter; but he was advised that they could not do more than this. With extensions, the Maidenhead works might be carried on for another fifteen years. He expected that the amalgamation with the Uxbridge Company would lead to economy in expenditure, and that overhead charges would be reduced. Asked whether it was contemplated that the Maidenhead undertaking should be kept going as a separate works, witness said it was to be a branch undertaking. The Engineer would be compensated to the equivalent of seven years' salary. He believed that the Company, if amalgamated, would be able to get coal more cheaply.

Mr. *H. E. Jones* (Chairman of the Uxbridge Company) testified to the sound financial position of the Company, and said that there had been an increase of 50 p.ct. in the total sales within the last few years. The desirability of the amalgamation scarcely needed demonstration, because the larger the concern, the more cheaply could gas be manufactured and distributed; and in this case there would be cheaper transport. As showing the advantages gained, both by the amalgamated Companies and the Uxbridge Company, in the past, he said that, after the Uxbridge Company had taken over the Beaconsfield and the Amersham undertakings, the price in Uxbridge had dropped by as much as 1s. 6d. per 1000 c.ft., and the Beaconsfield shareholders had received a larger dividend than previously. Amalgamation was the only hope of smaller companies, who could scarcely live under modern conditions, with the prevailing high wages and high cost of coal and transport. It was only by mass manufacture and selling that companies could live. The argument that Maidenhead would not benefit by the amalgamation, had astounded him; and he could not see how, if the Maidenhead Corporation were to purchase the undertaking, they would be in a better position to effect improvements such as would enable them to supply gas at a lower rate than the amalgamated Company. Everybody wanted gas cookers and heaters for purposes for which they had previously used coal, and therefore the demand for gas had increased accordingly. A gas undertaking could not build additional premises on a congested site to meet the greater demands without first pulling down existing buildings. This was expensive, and any engineer would try to avoid it. As to the use of water gas, if they acquired the undertaking they would not contemplate the use of this to the extent of 60 p.ct. That was far too high; and he was expecting an intimation from the Board of Trade or the Gas Referees that the amount used should be limited to 20 or 25 p.ct. The Maidenhead undertaking, in his view, had too much water-gas plant and insufficient coal-gas plant. The extensive use of water gas, he agreed, would lower the cost of gas, with oil at 2d. per gallon; but to-day it was nearer 6d. per gallon, and probably not less than 7d. at Maidenhead. Moreover, it was not likely to be reduced, having in view the increased demand for it for steam navigation purposes. With regard to the resources of the Uxbridge works, he said that improvements might be made there, and also at Maidenhead, by means of which he hoped to save 5d. per 1000 c.ft. in labour costs. It was possible largely to develop the use of gas in the Maidenhead district. As to a main to the Hillingdon Estate, the amalgamated Company would be prepared to lay a main if the Estate Company would pay the difference between the pre-war and the post-war costs of materials and labour, which meant practically one-half; and the Gas Company would have to take the risk whether the business were good or bad afterwards.

Cross-examined by Mr. KEEN, who put questions with regard to the Maidenhead undertaking being a "good thing," witness said that, in gas matters, he knew a good thing when he saw it. He saw a good thing in Maidenhead, and in Uxbridge. The Maidenhead Company at the moment, however, with a supply containing 60 p.ct. water gas, were "in a mess." He contemplated shutting-down the water-gas plant ultimately, for economic reasons; but the Maidenhead Company, if working alone, could only do this by spending £30,000. He would not discontinue the use of the water-gas plant altogether at first, but would largely reduce the output. It was the intention that half the gas sent to Maidenhead from other works should come from Wycombe, and the other half from Uxbridge. If there were a shortage at these works at any time, he could get gas from Amersham, or probably from Watford. He now bought gas from Watford to use elsewhere, because it was cheaper to do this than to lay long mains in order to get it from his own works to the consumers.

Replying to questions by Mr. JEEVES, in regard to the clause in the Maidenhead Company's Act for the protection of Lord Desborough, witness said there would be no difficulty in complying with Lord Desborough's objections as to what should be done on the land acquired from him. After expressing the opinion that gas could be supplied cheaper if the undertaking were in the hands of the amalgamated Company than if it were in the hands of the Corporation, he referred to the Hillingdon Estate Company, and said he was prepared to treat them on the same terms as they had been treated by the Ministry of Health.

At this point an opposition witness gave evidence, in order that he might be released to fulfil an appointment out of London. He was

Mr. *W. B. Keen*, chartered accountant, who gave figures with regard to the two Companies, from which he said he was convinced that amalgamation would be detrimental to the Maidenhead consumers.

The evidence on behalf of the promoters was then proceeded with.

Mr. *George Evetts*, consulting engineer, corroborated what had been said with regard to the condition of the Maidenhead works, and declared that the putting of the plant and premises in proper order would be too costly until an increase of business overtook it. In fact, the expenditure of the money would be a hopelessly impractical proposition. Gas for consumption in Maidenhead could be made more readily and more cheaply elsewhere by means of the amalgamation. Also, as the result of the amalgamation, the quality of the gas would be more consistent than previously. The Corporation, if they purchased the undertaking, could not get over the difficulties with respect to the site, and could not do anything in the way of improvements which the Maidenhead Company had not done. They would be hemmed in by the same restrictions, and could not, therefore, supply gas more cheaply. The interest on sinking fund would amount to more than the dividend would absorb if the undertaking were under company administration.

Tuesday, July 24.

Mr. *Evetts* continued his evidence, and again expressed the view that the Uxbridge Company could develop the Maidenhead undertaking at considerably lower cost than the Corporation could. He referred to the expenditure entailed by the methods of production at Uxbridge and at Maidenhead, to show that there would be a better chance of reduction in price under amalgamation than otherwise. There were two schemes which might be possible for the improvement of the Maidenhead works, one of which would cost about £38,000, and the other £80,000. Either of these would give the works a capacity of some 1,300,000 c.ft. per day; but the expenditure would have to be incurred before the business could be obtained which would justify it. Further, during alterations gas would have to be obtained from another undertaking.

Replying to Mr. KEEN, witness said that, even if the Corporation acquired the Maidenhead works, they would not preserve the amenities of the district any more than would the amalgamated Company. Rather he was of the opinion that the Corporation would not do so well in this respect.

Answering Mr. HONEY, witness said that the general lay-out of the mains at Maidenhead was good; but he could not speak with regard to their condition. There was no difficulty in regard to pressure.

Mr. *Arthur Valon*, consulting engineer, expressed the view that the terms of the proposed amalgamation were very fair to the Maidenhead shareholders. Dealing with the percentage of unaccounted-for gas in the case of the Uxbridge Company, which Mr. Keen had said, in his cross-examination of Mr. Walker, was higher than in the case of Maidenhead, witness remarked that such a straggling area as that of the Uxbridge Company required more looking-after than a more compact area; but there was no reason why the percentage should not be reduced.

Evidence was then given on behalf of the Maidenhead Corporation.

Mr. *G. M. Gill*, gas consultant, said he had inspected the works of the Maidenhead Company, and they were capable of making 750,000 c.ft. of gas per day—half coal gas and half water gas. The coal-gas plant, so far as the purifiers and some of the other apparatus were concerned, was quite up-to-date, and, leaving out the retort-house, should make 30 p.ct. more gas. The water-gas plant was deficient, but could easily be set right by completing a purifier already in course of erection; and this would put the Company in a safe position as regards purifying next winter. He believed the works on the old site could be put in order in six weeks, and could then turn out 20 p.ct. more gas than in the past. Properly developed, the undertaking could quite well make 1,500,000 c.ft. per day, utilizing the land recently acquired from Lord Desborough. By spending about £16,000, however, the capacity of the existing works could be increased by 50 p.ct. The necessary expenditure would involve an annual charge; but this could be covered by savings in manufacturing costs, while, in addition, there would be increased revenue from sales. The Maidenhead works were well adapted for giving a supply of gas to the Uxbridge district, but not for receiving it from there.

Mr. KERR announced that agreement had been reached between his clients and the promoters; and therefore he withdrew his objection. His clients had been met very fairly by the Uxbridge Company. It was arranged that the Company should lay the mains necessary on the Hillingdon Estate, on the understanding that the Estate Company paid the total capital cost at the outset, and that the amount expended should be repaid as soon as the revenue from the estate showed, for two years, a 20 p.ct. return.

Mr. *W. T. Stuchbery* (Mayor of Maidenhead, and Clerk to the Cookham Rural District Council) said that the Corporation were unanimously in favour of purchasing the gas undertaking, being of the

opinion that the consumers' interests would not be studied by the Uxbridge Company to the same extent as at present. The Directors of the Maidenhead Company were all local men; but the amalgamation would bring in a different set of Directors, who might not be looked upon so favourably by the ratepayers. The Corporation had decided to promote a Bill in Parliament for taking over the gas undertaking. The Cookham Rural District Council were in favour of the gas undertaking remaining separate; but he could not speak to the general attitude of the ratepayers on the subject of purchase by the Municipal Authority.

Friday, July 27.

On the resumption of the proceedings this morning, it was announced, on behalf of the Maidenhead Corporation, that it was not proposed to offer further evidence, because the witnesses it had been intended to call would cover practically the same ground as previous ones.

Mr. KEEN therefore addressed the Director of Gas Administration on behalf of the Corporation. He asked that the Uxbridge Company's proposal should be rejected, and the local undertaking left in the hands of the Maidenhead Company, regardless of whether or not Parliament might hereafter authorize the Corporation to purchase. Should Mr. Honey have any disposition to sanction the amalgamation, however, then he asked that the draft Order should not be made until an opportunity had been given to the Corporation to promote in Parliament a Bill for purchase. Counsel went on to discuss the powers of the Board of Trade under section 10 of the Gas Regulation Act, in the light of Mr. Jeeves's submission that, subject to the promoters satisfying the Department that the interests of the public would not be prejudiced by the amalgamation, they were entitled to ask for the Order to be deposited in Parliament. Mr. Jeeves, he said, had endeavoured to show that the functions of the Board of Trade were of a humble character, and that the Board had not a wide discretion in this matter. He himself submitted, however, that this was an entirely fallacious reading of the Act, and did not correspond with the position in which the Board of Trade were placed in this matter by Parliament. He examined the powers given to the Board of Trade under the Gas and Water Facilities Act, 1870, to make Provisional Orders, subject to confirmation by Parliament, and said it was clear that even wider powers were given to the Board under section 10 of the Gas Regulation Act than they had had under the Provisional Order procedure. The Board were put into the strongest possible position, and were authorized to consider the powers asked for by promoters of Orders, and to decide whether these should go forward. In the course of his argument, Counsel said that another fallacious proposition was that this transfer did not constitute a sale, and that the identity of the capital, dividends, &c., would be maintained. It was true that there was a dividend on the separate Maidenhead shares, which should depend on the price of gas in Maidenhead; but there was nothing whatever in the draft Order to provide that the price in Maidenhead had to be regulated by the profits made in Maidenhead, or by the cost of producing gas in Maidenhead. It was for the amalgamated Company to fix what price they thought right in Maidenhead. Again, it was important to recognize that the shareholders of the present Maidenhead Company would be only a minority of the shareholders in the amalgamated Company.

Mr. HONEY asked if Mr. Keen could refer him to any figures given in evidence showing how this kind of arrangement would work.

Mr. KEEN said there had been no figures given in evidence to show how it would work, and he did not think there could be, because what would happen would depend on the way in which the undertaking was conducted in future. There would be one Board of Directors, able to fix the price of gas for Maidenhead as well as for the other parts of the area. If it had been said that the Maidenhead undertaking was to be carried on entirely separately, that there would be separate accounts of cost of manufacture and distribution, so that they could arrive at the separate profits made on the Maidenhead undertaking, they could then have urged that there would be a relation between the Maidenhead dividends and the Maidenhead price of gas. But evidently the desire was to carry on the whole as one undertaking; and from the point of view of the Maidenhead consumers the protection was illusory.

Mr. HONEY asked, assuming the Order were passed, what kind of protection Counsel suggested in place of retaining the Maidenhead standard price.

Mr. KEEN said he could not suggest any form of protection which would be satisfactory, because the only thing he could imagine which would give the Maidenhead consumers the benefit of the advantageous conditions of the Maidenhead undertaking would be to keep it entirely separate; but if it were kept separate, what advantage would there be to the amalgamated Company? The question of the price of gas was not the only thing he was concerned with. He wanted local management, which meant sympathetic management. The real interest that ought to be considered here was the interest of the people of Maidenhead; and he was very glad to gain the impression from Mr. Walker's evidence that he, and presumably the Directors who had been working with him in the past, recognized that they had been carrying on a duty to the local public. He submitted that it was because of this public spirit on the part of the Maidenhead Company in the past that they had supplied gas so well; and it had been said in evidence that the consumers were pleased with the supply. Referring to the proposal that compensation should be given to the extent of seven years' fees to the Directors and seven years' salary to the Engineer, Counsel said this was very generous. In the early days, when there were many gas and water transfers, Parliament had set its face against compensation to directors; but in cases of hardship, where officials were losing their jobs, compensation was allowed. In the case of the acquisition of the dock companies by the Port of London Authority under their Act of 1908, there was generous provision for compensation; and he was not at all sure that the practice had not been a little influenced in this respect since that time. But, so far as he was aware, there had been no definite departure from the Parliamentary principle laid down in many cases, that compensation should not be given to directors.

Mr. HONEY admitted the Port of London case, but asked Mr. Keen whether he would say that recent Parliamentary practice was to refuse compensation to directors.

Mr. KEEN replied that in recent years there had not been many cases of compulsory transfer. They were mostly by agreement.

Mr. HONEY asked whether there was compensation in cases of agreement.

Mr. KEEN stated that, from his own recollection, there had been more cases in recent years in which agreement had provided for compensation to directors; but, so far as he was aware, there had been no general departure from the early principle which used to be recognized in compulsory-purchase cases.

Mr. HONEY asked whether there had been any case in which, when Parliament had been asked to sanction an agreement for transfer of an undertaking, they had refused to allow agreed compensation.

Mr. KEEN was not aware of any.

Mr. HONEY went on to say that what he really wanted to know was whether Mr. Keen was suggesting that, assuming the Order were granted, the Board of Trade should refuse to allow this compensation to be paid, or whether he was arguing merely that this was one of the general grounds upon which the transfer of the undertaking would not be advantageous to the Maidenhead consumers.

Mr. KEEN said he was arguing rather from the latter point of view than the former. This was a provision which was meant to sweeten the path of those interested. Another matter, he went on, in which the Uxbridge Company had obviously tried to sweeten this to the Maidenhead Company, and to give it an attractive flavour, was the reduction of price in 1923. He asked the Board of Trade, in judging of the respective merits of the two undertakings, to ignore all questions of reduction of price after December, 1922. There was no guarantee of what was to be the effect of these reductions on the accounts. They might result in a loss at the end of the financial year, and the price might have to be raised again. There was no guarantee that the reduction would be a stable one. He maintained that the figures he had put forward had shown that the Maidenhead Company came out better all round, whether they looked at price of gas, cost of production, unaccounted-for gas, expenditure on repairs, capital expenditure per million c.ft., the character of the area of supply, the degree of uniformity in the summer and winter demand, the financial position, or any other element in the past history. The whole thing was merely a bubble, which Mr. Gill had exploded. Mr. Gill had shown that there was no difficulty in carrying on the undertaking now and for many years to come, and that there was no need for the Maidenhead Company to take this suggested bulk supply from outside. There was no advantage in it, and no guarantee that it could be properly given, having regard to the undertakings from which it was suggested it should be taken. There was nothing in the way of maintenance and development which could not be done just as well—better, indeed—by the separate existence of the undertaking as a local concern.

Mr. JEEVES then summed up on behalf of the promoters. The real issue, he said, was as to whether this was a proper arrangement in the light of its effect on the interests of the consumers. If this proposition were not going to prejudice consumers in Maidenhead, then, if the two companies whose money was concerned desired it, they were entitled to ask that it should be allowed. So far from this prejudicing the consumers in Maidenhead, however, the evidence had established without doubt that it would be to their advantage. Mr. Gill had been called in on July 5 last, had been over the Maidenhead works two or three times, and had not even gone into the figures; and yet Mr. Keen had the audacity to suggest that his evidence should outweigh that given on behalf of the two Companies concerned. Counsel went over the difficulties which had faced the Maidenhead Company, and said that, if Mr. Gill's evidence were allowed to stand, then the Company were fools, and did not know what was needed. Counsel paid a tribute to Mr. Walker, the Chairman of the Maidenhead Company, adding that unless a Chairman had been also a gas engineer, he could not have shown more intimate and close knowledge of the affairs of his Company than did Mr. Walker. Mr. Walker had also shown that he and his co-Directors were actuated as much by a desire to serve the consumers in their area as to benefit their own pockets. Mr. Jones, the Chairman of the Uxbridge Company, had contrasted the policy to be pursued by Maidenhead as a separate Company with that to be pursued by the amalgamated Company; and he submitted that Mr. Jones was not touched once by Mr. Keen in his cross-examination. Mr. Evetts and Mr. Valon were, at all events, in as honest a position as Mr. Gill; and he asked Mr. Honey to contrast the evidence of the engineers and see what was the position. He (Counsel) had never been concerned in a case in which evidence called on behalf of the promoters had been so little touched in any one practical particular. With regard to the Corporation's objection to compensation, he knew of no case in which Parliament had refused to confirm reasonable provisions; and he could quote cases in which more than seven years' fees had been paid to directors. The two Companies had tried to be reasonable to the outgoing Directors on the one hand, and not extravagant in burdening the undertaking on the other. The Uxbridge Company were perfectly prepared to insert a provision in the Order that the price of gas in the Maidenhead Borough—*i.e.*, the central part of the area—in which a lower price was charged by the Maidenhead Company than in the outer area, should not at any time be higher (it might be less) than the price charged at the same time within the Urban District of Uxbridge, which was the central area of the present Uxbridge Company.

Mr. KEEN said this clause did not meet the Corporation.

Mr. JEEVES (continuing) remarked that everything was in favour of amalgamation; and, if the Order were granted, the consumers, within a year or two, would be ready to acknowledge the wisdom of the Board of Trade in allowing this development to take place.

Newbury Corporation Gas Order.

Owing to the pressure on our columns this week, the publication is deferred of the report of the inquiry by Mr. H. C. Honey (Director of Gas Administration) into the draft Order of the Newbury Corporation, under section 10 of the Gas Regulation Act. The principal purpose of the Order is to extend the limits of supply beyond the borough boundary.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

It is a long time since there was such a pessimistic feeling on the market as at the end of this week. It might almost be said that there was no market at all. Tonnage has been seriously affected by the dockers' strike; and collieries, which were nominally fully sold for this month, have had to go on the market and offer coal at reduced prices in order to try to keep the pits working. In very few cases, however, have there been any buyers even at prices which would leave the collieries no profit at all; and in several instances there has been idle time, simply through lack of any outlet whatever for the coal. The strike situation, the European political uncertainty, the mere fact of sellers offering coal at such reduced prices, all these factors seem to be inducing buyers to hold off completely.

In these circumstances, the market for forward has scarcely been tested. Anyone who could put in prompt and definite boats for the immediate future could undoubtedly get some very cheap coal, as it is easy enough to find collieries of all classes who are none too well stemmed for the next week or two. It is impossible to say what prices could be fixed up for a period of (say) six months ahead; no one apparently is trying to do so. But, while nominal quotations for best gas are something like 27s. 6d. f.o.b., and seconds 24s. to 25s., best qualities are offering at 25s. for anything like definite business for August. Even at this figure there is competition for orders, and, in the present state of affairs, would-be buyers will probably be coming back with counter-offers. It may be mentioned that, at the rate of wages payable for August, this f.o.b. price is, in many cases, getting very near the cost price at the pithead.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Fixtures are being reported in the ordinary way in the gas coal trade in Yorkshire and Lancashire, and it is expected that the majority of the consumers will soon have filled their requirements. Collieries as a general rule have not altogether maintained the prices they were anticipating, although advances of 1s. 6d. per ton are reported as compared with last year. The lack of demand for all descriptions of domestic fuel continues, and this state of affairs is likely to prevail until September, when householders generally consider their purchases. The foreign demand for screened coals continues quiet. Some collieries have in consequence a difficulty in working full time; while in others stocks are being accumulated to some extent.

The industrial situation appears to get worse. Possibly this is accounted for by the general uncertainty existing abroad, where the rates of exchange are so much against the foreigner that he is prohibited from making his usual purchases.

There is a good demand for furnace and gas cokes from the Scandinavian countries; while Belgium also is taking a fair amount of washed and other nuts.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The coal trade in the Midland area has slumped to some extent. The depressed state of general industries is reflected in the diminished demand for slacks, nuts and beans, and gas coal. Add to this the marked falling-off in the export trade, which has been going on now for some weeks, and we have the situation in a nutshell. Some collieries are less affected than others, and are losing probably not more than one day a week. Those more remotely situated from industrial districts lose about two days; and the holidays next week will be welcome rather than otherwise. August usually is a period of inactivity in the industrial branches; and all the collieries can hope to do is to make the best of the situation and struggle on until the arrival of better times. Curiously enough, although trade has diminished, prices are in the main upheld. The primary reason is that it is felt that buying would not be stimulated by a reduction, and that it would be suicidal to embark upon a competition in cutting that would bring values down to an uneconomic level. The only concessions that have been made are in best selected coal. To induce householders to stock, some collieries have conceded about 2s. a ton. Even this, however, is not general.

Reduction at Henley-on-Thames.—The Henley-on-Thames Gas Company announce a reduction of 5d. per 1000 c.ft., commencing with the quarter ended June. The price to ordinary consumers is now 4s. 10d. per 1000 c.ft.

Skegness Gas Undertaking.—Since the Skegness Urban District Council acquired the local gas undertaking, there has been a series of unprofitable experiences, leading to the necessity of a rate of 1s. 3d. in the pound being taken to make good the deficiency upon the works, although 5s. 3d. per 1000 c.ft. has been charged for gas. Feeling has now culminated in strong opposition to the Council's proposal to adopt the therm system. The Property Owners and Ratepayers' Association have taken the matter up, and addressed a letter to the Board of Trade, objecting, first, to the maximum price of 1s. 6d. per therm which it is proposed to charge, and, secondly, to the calorific standard of 460 B.Th.U. for which the Council are applying. With respect to the latter, the objectors point out that when the original Skegness Company applied for their Act, the Council insisted upon a standard of 540 B.Th.U.; and such standard was incorporated in the Company's own Act. Further, it is emphasized that, in addition to the price at present charged—namely, 5s. 3d. per 1000 c.ft.—there is also a rate-in-aid representing the loss referred to on the present year. This amount if divided into the year's make of gas (40½ million c.ft.) equals 11½d. per 1000 c.ft., which, added to the 5s. 3d. already charged, brings the total up to 6s. 2¾d. The Board of Trade has been appealed to, to make close investigations into the proposals of the Council.

Horncastle's Proposed New Gas Plant.

Recent difficulties in regard to gas supply at Horncastle led to an inquiry being held on Tuesday, July 17, by Mr. H. R. Hooper, one of the Engineering Inspectors of the Ministry of Health, into an application by the Urban Council for authority to borrow £6400 for the purpose of installing a Tully plant at the works. It was explained that the undertaking was established in 1876, and that there is an overdraft at the bank. Under the Act, the Council were allowed to borrow £20,000, which they had done. A sum of £3241 is still owing on the old loan; and this it was estimated would be liquidated in four years' time. The price of gas is 5s. 10d. Mr. Tully explained the proposed new plant, which it was computed would cost £2500. It was a combined plant for coal and water gas, and the cost of producing 1000 c.ft. of gas would be 2s. 2d. The Inspector inquired what the present cost of production was, and whether the Council were making a profit. Mr. R. Chatterton (Clerk to the Council) replied that the figures had never been gone into. The Inspector suggested the necessity of the Council's obtaining assistance to put the accounts in proper order before work was commenced with the new plant. It was a commercial undertaking, and the Council should know exactly how matters stood. An endeavour should be made to sell gas as cheaply as possible, and then everybody would be satisfied. The price at Horncastle was very high, and might never be reduced until the accounts were properly kept. He thought that in time matters might be pulled round. It transpired that the total cost of installing the new plant, including the purchase price, would be £6400, allowing £500 for contingencies.

Hebden Bridge and Mytholmroyd Gas Board.

At the twenty-seventh annual meeting of the Hebden Bridge and Mytholmroyd Gas Board, Councillor A. Sutcliffe, who presided, submitted the annual report, which showed the gross profits for the year to be £7826. After providing for dividend, interest, and sinking fund, the net profit was £3224, compared with a net loss of £2830 in the previous year. The stock issued and capital borrowed to the end of the year was £115,995, and the capital expenditure was £123,821. The gas manufactured during the year, including 7,936,000 c.ft. of water gas, was 104,985,000 c.ft., an increase of 1,284,000 c.ft. A total of 7215 tons of coal was carbonized. The gas unaccounted-for had been reduced from 8·2 p.ct. to 7·18 p.ct. Councillor Sutcliffe said that during the latter part of the year the price of gas had been reduced by 3d. per 1000 c.ft. The Board had set aside towards the redemption of the sinking fund in 1945, a sum of £55,867. With the amount carried forward, they had a reserve balance of £5491. The Order had been obtained to start charging on the therm basis; and it would be put into operation shortly. The maximum price fixed was 1s. 3 6d. per therm, equal to 5s. 10·2d. per 1000 c.ft. In reply to Councillor G. Atuck, who drew attention to the fact that, in the neighbouring district of Sowerby Bridge, coke was cheaper, and the gas only just over 3s. per 1000 c.ft., Councillor Sutcliffe said that at Hebden Bridge they had heavy capital charges to contend with, representing, in interest and sinking fund, nearly 1s. upon every 1000 c.ft. of gas made. It was decided to fix the price of coke at 25s. per ton. The price of gas was reduced from 5s. 3d. per 1000 c.ft. to 4s. 10½d. The therm rate will be 1s. 1d. per therm. For those using over 50,000 c.ft., and for heating and cooking purposes, the price was reduced from 5s. to 4s. 6d., and the therm rate fixed at 1s. The old discounts will continue to apply.

Gas or Electricity for Shaldon?

Mr. W. M. Bird presided over a representative meeting at Shaldon, to consider the Teignmouth Council's proposals for taking gas there by means of a submarine pipe line. The Teignmouth Electric Lighting Company have also promised to take current there. The Chairman said that, as the Council had sent their plans to the Board of Trade, it looked as if they had decided to bring the gas to them. It would have been wiser had the local governing body first had a poll. If the streets only were lit with gas, and the occupiers of houses did not take it, he doubted whether it would pay. The Electric Light Company were not in a position to light Shaldon for some time, owing to lack of capital. They were, however, extending their cables at Teignmouth. Mr. H. Luttrell-Gordon understood that it would cost from £5000 to £10,000 to bring gas to Shaldon. If it cost £8000, the Council would have to provide about £400 a year interest. He understood a protest had been made at Teignmouth about the cost and quality of gas. At Shaldon the ceilings of many of the houses were too low for the use of gas, and it would be dangerous. Mr. H. Higham, Gas Manager to the Council, said he did not think the ratepayers of Teignmouth had ever been called upon to meet a deficiency on the gas undertaking. Dr. A. G. Holman was in favour of gas, as it cost him 2s. 6d. to boil half-a-pint of water on a hotplate by electricity. He considered that not 5 p.ct. of the people of Shaldon would cook by electricity, if it was brought to the place. It would be dangerous to instal electric light in many of the houses at Shaldon. Mr. Higham said the gas at Teignmouth was at present 14 c.p. and 400 B.Th.U. Mr. H. C. Full (ex-Chairman of the Council) alleged that Mr. Luttrell-Gordon had made wrong statements concerning the gas. A resolution asking the Council to bring in gas was proposed by Mr. Full and seconded by Mr. Wakeham. The voting was, however, equal; and Mr. Full then moved that the meeting stand adjourned. This was agreed to.

Tickhill Gas Supply.—The Tickhill (Doncaster) Gas-Works, formerly run by a company, latterly by Mr. R. W. Merriman, Managing-Director of Coal Factors, Limited, of Doncaster, are now taken over by a newly-formed Company, named the Tickhill Gas Light and Coke Company, Ltd., with a capital of £5000. Mr. J. F. Scott, of Pontefract (late of Tickhill), is Chairman, and Mr. Merriman is Managing-Director of the Company, who take working control from to-day. Extensive business development has been made of late, particularly in regard to lighting and cooking. The works are now manufacturing four times the quantity of gas made during a corresponding period last year.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 30.

In the London tar products market pitch is quoted at not below 150s. net per ton *ex* makers' works; and producers are now dealing with inquiries for next season's shipment. Creosote keeps firm at from 10d. to 10¼d. per gallon in bulk. Solvent naphtha and toluole remain at the last prices quoted, though benzole for motors has dropped in price owing to the recent reduction in petrol. There is nothing of interest to report about other products, except that tar for roads is still in great demand.

Tar Products in the Provinces.

July 30.

The market for tar products has been firm throughout the past week, and pitch has been quietly steady at about the same prices as before. The sudden rise has to a certain extent frightened buyers; and this, combined with the present Continental rates of exchange in France and Belgium—particularly the latter—make them unwilling to entertain purchases before they are absolutely compelled to do so. But it is evident that there is not much pitch available; and makers are quite prepared to hold for present values. Benzole, of course, has been affected by the fall in petrol; the full reduction in the price of petrol having to be allowed on this article. This has also caused a heavy depreciation in solvent naphtha, which has sympathetically followed both benzole and toluole. Heavy naphtha is also dull, as the paint trade appears to be very quiet at present. Carbolic acid is quiet, there having been a fall in the value of crystals.

The average values for gas-works products during last week were: Gas-works coal tar, 86s. 3d. to 91s. 3d. Pitch, East Coast, 142s. 6d. to 147s. 6d. f.o.b. West Coast—Manchester, 140s. to 145s.; Liverpool, 141s. to 146s.; Clyde, 141s. to 146s. Benzole 90 p.c.t., North, 1s. 2½d. to 1s. 3½d.; crude 65 p.c.t. at 120° C., 10d. to 10½d. naked at makers' works; 50-90 p.c.t., naked, North, 1s. 7d. to 1s. 7⅞d. Toluole, naked, North, 1s. 7d. to 1s. 8d. nominal. Coal tar crude naphtha in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 3½d. to 1s. 5d. Heavy naphtha, North, 1s. 5½d. to 1s. 7½d. Creosote, in bulk, North, liquid, 8d. to 8½d.; salty, 7⅞d. to 8d.; Scotland, 6⅞d. to 7½d. Heavy oils, in bulk, North, 8½d. to 9d. Carbolic acid, 60 p.c.t., 3s. 4d. to 3s. 5d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.c.t., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, according to the sliding-scale, for the month of June was £5 2s. 7·44d. per ton.

Emscote Foundry Company.—A Company bearing this title has been registered with a capital of £3000, to carry on business as iron-founders and manufacturers of gas cookers, stoves, and fires and central heating apparatus. The address is No. 235, Westminster Bridge Road, London, S.E.

Finances at Todmorden.—The accounts of the Todmorden Corporation gas undertaking for last year show a profit of £6968. Three months ago there was a reduction of 3d. per 1000 c.ft. in the price of gas, and a further reduction of 5d. is to be made. In future, charges are to be on the therm basis; the rate being 1s. 2d. per therm.

Plympton St. Maurice Lighting.—By a unanimous vote, the parishioners of Plympton St. Maurice approved of the Parish Council's contract with the Plymouth Gas Company for the lighting of the parish. Paymaster Commander S. G. Andrews, who presided at a public meeting, stated that an electricity undertaking had quoted a charge of £2 16s. per lamp. The Gas Company were then approached; and an offer of £2 6s. 6d. per lamp for a three-years' contract was made. Following upon this, the electricity concern had attempted to undercut this offer by quoting £2 5s. This method of carrying-on business had not been appreciated; and consequently the contract had been placed with the Gas Company.

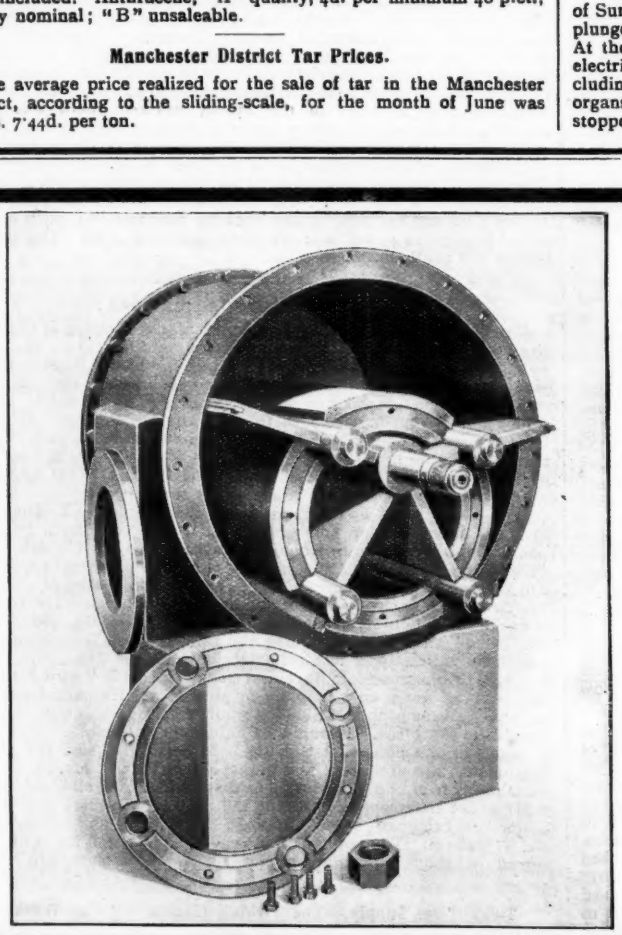
The Leek Urban District Council decided at their meeting last week to spend £22,500 on the installation of a system of vertical retorts.

The Mansfield Town Council have made a substantial profit on the gas undertaking during the past year, and have decided to place this to a fund for putting the concern on a sound financial footing, rather than to give anything to the relief of the rates.

Request has been made to the Accrington District Gas Board to extend their supply to include Whalley and part of Billington. The Board are favourably disposed to consider the extension of their area. A Provisional Order will have to be obtained from the Board of Trade.

The annual outing of the staff of the Sheffield Gas Company took place on Saturday last. A party of about one hundred, including Mr. and Mrs. H. Chamberlain and Mr. and Mrs. H. H. Collett, proceeded by chars-a-bancs to Monsal Dale *via* Stoney Middleton. An enjoyable day was spent; the weather being beautifully fine. Mr. and Mrs. Ralph Halkett joined the party at tea at Ashford-in-the-Water. The return journey was made *via* Bakewell and Baslow.

One of the "joys" of electricity was experienced on the evening of Sunday, July 22, at Halifax, when a mishap at the electricity works plunged all electrically lighted places into darkness for forty minutes. At the churches the services were nearing completion; but where electricity was used, the lights went out in the middle of the concluding hymn. In one or two churches where are electrically-driven organs, the music ceased abruptly. The electric trams, of course, stopped running.



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STOCK MARKET REPORT.

THE week just closed on the Stock Exchange was not everything that could be desired. It opened with some promising indications here and there in popular lines; but they were not wide enough to embrace a broad field of action, and things soon fell very quiet. On Tuesday, prices for the most part weakened in sympathy with the lessening proportions of business done, and the gilt-edged favourites felt it. Wednesday, if anything, was more depressed. Home Government issues were very heavy, Home Rails and Argentines were flat, and the Foreign Market showed weakness. Thursday opened nervous and hesitating, but cheered up a little on finding no great preference to sell, and Friday displayed some hopefulness.

Business in the Gas Market presented nothing of striking interest, being pretty well already reduced to the ordinary August holiday proportions. Prices might be written as steady; alterations of quotation being for the most part *ex div.* adjustments without change of values.

The following transactions in gas during the week were recorded: On Monday, Bournemouth 5 p.ct. 12½, ditto "B" 12½, Commercial 4 p.ct. 97, 98¾, European 7⅞, 8¼, Gas Light ordinary 97⅞, 98, 98¼, 98⅜, 98½, ditto 4 p.ct. preference 80⅜, 82, Imperial Continental 161, Lea Bridge ordinary 98½, Liverpool 5 p.ct. ordinary 90¾, Malta and Mediterranean 75s., Primitiva 7s., ditto 5 p.ct. preference 34s., San Paulo 6 p.ct. preference 5⅞, South Metropolitan 98, 98½, ditto 6½ p.ct. debenture 106½, South Suburban 5 p.ct. debenture 97, 98, Tottenham "B" 104, 104½, ditto 6 p.ct. mortgage 99½, Brentford 7½ p.ct. mortgage 102¾, 103¼, Richmond 5 p.ct. debenture 92, 93, Wandsworth 3½ p.ct. New 103. On Tuesday, Alliance and Dublin 72½, Bournemouth 5 p.ct. 12½, ditto "B" 12½, Gas Light ordinary 98, 98½, 98⅝, Hastings and St. Leonards 5 p.ct. 96½, ditto 3½ p.ct. 76, Montevideo 50, Primitiva 6s., 7s. 6d., ditto 5 p.ct. preference 34s. 6d., South Metropolitan 98⅛, 98⅜, 99, South Suburban 5 p.ct. debenture 97, 98, Croydon 5 p.ct. debenture 96½, Wandsworth 3½ p.ct. New 102½. On Wednesday, Brentford "A" 102½, Brighton and Hove original 177½, 179, British 12⅜, ditto "B" 11½, Continental Union 37½, European 8, Gas Light ordinary 98, 98⅛, 98⅜, 98⅝, 98⅞, 99, ditto 3½ p.ct. maximum 67½, Hastings and St. Leonards 5 p.ct. 97, ditto 3½ p.ct. 76½, Imperial Continental 159½, Montevideo 50, 50½, Portsea "B" 106, 107, ditto "C" 99½, 100, ditto 4 p.ct. debenture 76, 77, Primitiva 6s., ditto 5 p.ct. preference, 32s. 6d, 33s., 34s. 6d., South Metropolitan 98½, 99½, 99⅛, ditto 3 p.ct. debenture 61½, 62½, South Suburban 103. On Thursday, Continental Union 39½, European 7⅞, 8, Gas Light ordinary 96⅞, 97, 98, 98⅛, ditto 4 p.ct. preference 80, 81½, Liverpool 7 p.ct. preference 108, South Metropolitan 97, 97½, South Suburban 103½, Newport (Mon.) 5 p.ct. maximum 85. On Friday, Brentford "A" 102½, European 7⅞, Gas Light ordinary 96⅜, 96½, ditto 3½ p.ct. maximum 65, ditto 4 p.ct. preference 80½, 81, Imperial Continental 159½, Primitiva 5s., ditto 5 p.ct. preference 32s. 6d., 33s., San Paulo 5 p.ct. debenture 40, 40½, South Metropolitan 97½, 97⅝, ditto 5 p.ct. preference 98, Tottenham "A" 122⅜, ditto "B" 101⅜, Wandsworth 3½ p.ct. New 103.

In the Money Market, there was great variety, abundance of supplies alternating in rather quick succession with some tendencies to hardness. The more comfortable condition, however, had the best of the struggle, and at the close of the week the position was easy to a marked degree. Discount did not at all times move in harmony; but closing rates were quite easy. The Bank of England rate is 4 p.ct., as fixed on July 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	74—79	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	72—77	...
1,551,868	,,	Apl. 5	2½	5%	Alliance & Dublin Ord.	59—64	72—77	72½
374,000	,,	July 12	4	4%	Do. 4 p.c. Deb.	76—79	62—67	..
280,000	5	May 17	7½	4/-	Bombay, Ltd.	5½—6½	5—5½	...
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water { 5 p.c.	..	12—13	12½—12¾
383,110	10	,,	7	7/-	Bournemouth Gas and Water { B 7 p.c.	15—15½	12—13	12½—12¾
115,000	10	,,	6	6/-	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	10¾—11¼	...
162,065	—	June 28	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	77—82	..
992,045	Stk.	July 12	14	6t/-	Brentford A Consolid.	261—266	100—105	102—102½
734,920	,,	,,	11	6t/3	Do. B New	204—209	100—103	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—88	..
221,400	,,	June 14	4	4%	Do. 4 p.c. Deb.	91—93	77—82	...
214,775	,,	Mar. 8	11	11%	Brighton & Hove Orig.	208—213	175—180	177—179
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	130—135	...
1,272,500	Stk.	July 26	5	5%	Bristol 5 p.c. max.	..	90—93*	..
370,000	20	Mar. 22	12½	10/-	British A Ord.	44—45	12¾—13¼	12¾
10,000	10	June 28	—	7/-	Do. 7 p.c. Pref.	..	11¾—12¾	..
120,000	Stk.	,,	4	4%	Do. 4 p.c. Deb. Stk.	88—90	74—79	...
220,335	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	56—59	...
100,000	10	May 1	—	—	Cape Town & Dis., Ltd.	1¾—2¼	6¾—7¼	...
100,000	10	May 3	—	4/6	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	June 28	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	70—75	...
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	106—111	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 25	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	94—97*	97—98¾
560,000	,,	,,	5¾	60/-	Do. 3½ p.c. do.	103—105	94—97*	..
475,000	,,	June 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	56—61	..
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	37—41	37¼—39¼
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	72—77	..
660,000		Mar. 8	—	6%	Croydon sliding scale.	..	103—106	...
284,975		,,	—	5%	Do. max. div.	..	83—86	...
492,270	Stk.	—	6	4¾%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Apl. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5/0	European, Ltd.	17½—18	7¾—8½	7¾—8½
16,546,120	Stk.	July 26	1/17/4	52/-	Gas { 4 p.c. Ord.	98—102	96—98*	96¾—99
2,600,000	,,	,,	3¾	35/-	Gas { 3½ p.c. max.	76—79	65—68*	65—67½
4,062,235	,,	,,	4	4%	Light { 4 p.c. Con. Pref.	96—99	79¾—81½*	80—82
4,761,930	,,	June 14	3	3%	and { 3 p.c. Con. Deb.	72¾—74¾	60—63	..
130,000	,,	Dec. 11	10	10%	Coke { 10 p.c. Bonds	..	..	..
—	—	—	—	—	Coke { 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 8	5	65/7½	Hastings & St. L. 5 p.c.	..	92—97	96½—97
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	75—78	76—76½
70,000	10	May 17	11	10%	Hongkong & China, Ltd.	16¼—16¾	15—16	...
86,600	Stk.	Mar. 8	9	9½%	Hornsey 7 p.c.	..	147—152	...
1,976,000	,,	May 31	9	8.17	Imperial Continental	150—160	157—162	158—162
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	76—78	77
235,242	,,	Mar. 8	6¼	6¼%	Lea Bridge Ord. 5 p.c.	119—121	97—102	98½
2,498,903	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	90¾
600,000	,,	Mar. 22	—	7%	,, 7 p.c. Pref.	..	107—110	108
165,736	,,	Feb. 22	7/5/6	80/-	Maidstone 5 p.c.	..	107—112	...
63,480	,,	June 28	—	3%	Do. 3 p.c. Deb.	..	52—57	...
75,000	5	June 14	6	3/6	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4¼—4¾	3¾—4	3¾
100,000	100	Apl. 5	4½	4½%		99—101	97—100	...
541,920	Stk.	May 17	4	4%	Montevideo, Ltd.	11¼—12	50—55	50—50½
1,875,892	,,	July 25	4¼	4¼%	Newcastle & Gatsh'd Con.	98¼—99¼	84½—85½*	...
250,166	,,	Feb. 22	—	4%	Do. 4 p.c. Pref. Stk.	..	71—73	...
129,705	,,	June 28	3¼	3¼%	Do. 3½ p.c. Deb.	82—83	70—72	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Mar. 8	7/14/0	7/8¾	,, ,, 7 p.c.	14—15	12—13	...
300,000	Stk.	May 3	8	8%	Oriental, Ltd.	117—122	97—102	...
188,120	Stk.	June 28	—	78/9	Plym'th & Stonh'se 5 p.c.	..	106—110	...
60,000	50	Mar. 8	13	65/-	Portsea Island, B	128—131	103—108	...
100,000	50	,,	12	60/-	Do. C	118—121	100—105	...
290,059	5	—	8	—	Primitiva Ord.	5¼—6	¾—¾	5/—7/6
499,960	5	—	5	—	Do. 5 p.c. Pref.	4¾—5	1¾—2	32/6—34/6
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	73—75	...
600,000	Stk.	July 26	4	4%	Do. ,, ,, 1911	..	56—59*	...
346,198	,,	June 28	4	4%	River Plate 4 p.c. Deb.	85—87	56—59	...
150,000	10	Mar. 22	6	6/-	San Paulo { 6 p.c. Pref.	10¾—11	5¾—6¼	5¾
125,000	50	July 2	5	5%	San Paulo { 5 p.c. Deb.	47—49	37—40	40—40½
135,000	Stk.	Mar. 22	10	5%	Sheffield A	223—224	105—107	..
209,984	,,	,,	10	5%	Do. B	223—224	105—107	...
525,300	,,	,,	10	5%	Do. C	220—222	105—107	105¼
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 31	9	9/-	South African	10¼—11¼	8—10	...
6,609,895	Stk.	July 26	5/4/0	50/-	South Met. Ord.	111—113	96—98*	97—99¼
250,000	,,	July 12	—	5%	Do. Red. Pref.	..	97—99	98
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72¼—74¼	61—63	61¾—62¼
734,000	,,	Mar. 8	—	6½%	Do. 6½ p.c. Deb.	..	106—108	106½
91,500	,,	Feb. 22	8½	8½%	South Shields Con. Stk.	157—159	129—131	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	102—105	103—103¾
368,837	,,	June 28	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	97—98
647,740	,,	May 3	5	7%	S'th'mpt'n Ord. 5p c. max.	99—102	88—91	...
121,275	,,	June 28	4	4%	Do. 4 p.c. Deb. Stk.	..	72—77	...
250,000	,,	Mar. 8	—	70/-	Swansea 7 p.c. Pref. Stk.	..	103—105	...
200,000	,,	June 28	—	6½%	Do. 6½ p.c. Deb. Stk.	..	105—107	...
120,000	,,	July 26	—	8%	Tottenham { A 5 p.c.	135—138	120—125*	122¾
782,275	,,	,,	6	6½%	Tottenham { B 3½ p.c.	115—117	100—105*	101¾—104½
181,255	,,	June 14	4	4%	District { 4 p.c. Deb.	87—89	78—82	...
258,251	Stk.	Mar. 22	5	5%	Tynemouth 5 p.c. max.	108½—109	90—92	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 12	8½	90/-	Wandsworth A 5 p.c.	151—156	126—131	...
255,636	,,	,,	6½	75/-	Do. B 3½ p.c.	129—134	112—117	...
108,075	,,	,,	—	63/-	Do. C	—	97—102	...
140,865	,,	,,	—	63/-	New Ordinary	—	97—102	103
152,000	,,	,,	6½	71/3	Wimbledon 5 p.c.	117—122	109—114	...
98,000	,,	,,	6½	76/3	Epsom 5 p.c.	121—126	112—117	...
88,416	,,	June 28	5	5%	5 p.c Deb. Stk.	66—69	57—60	...

* Ex. div.

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